REDBIRD
MASTER PLAN

Indiana Department of Natural Resources
April 6, 2012

REDBIRD
MASTER PLAN

Prepared for: Indiana Department of Natural Resources
Division of Engineering
Division of Outdoor Recreation

Prepared by: Indiana Department of Natural Resources
Division of Communications

April 6, 2012

Indiana Department of Natural Resources:

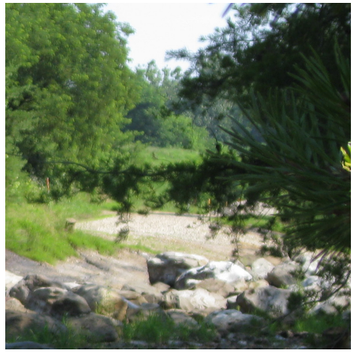
DNR
Indiana Department
of Natural Resources

Division of Outdoor Recreation
402 West Washington Street
Room W271
Indianapolis, Indiana 46204
Phone: 317.232.4070
Fax: 317.233.4648

Division of Engineering
402 West Washington Street
Room W299
Indianapolis, Indiana 46204
Phone: 317.232.4150
Fax: 317.233.1205

Table of Contents

List of Figures



Section 1: Plan Summary

Antioch Power Plant

Drag Line for Strip / Surface Mining

1.A REDBIRD STATE RECREATION AREA – HISTORY

Redbird State Recreation Area (Redbird) is more than 1400 acres of former coal mine land that is intimately associated with the history of coal mining in Indiana. At one time, Indiana was fourth in the nation in coal production. The United Mine Workers Association lists more than 860 union mines in southern Indiana. This list is probably not comprehensive but includes a high percentage of the known operations. Greene and Sullivan counties, the home of Redbird, were among the most prolific coal production counties in Indiana. More than 223 active coal mines were documented throughout the history of Greene and Sullivan counties.

During the late 1800s and early 1900s, there were multiple small mining operations on or near Redbird. Increased population came with the increased coal production. The era of the boom town was evident in this part of Indiana as miners and their families moved to Greene and Sullivan counties. Starting in 1884, Linton, less than four miles southeast of Redbird as the crow flies, became a typical coal mine boom town. The population rose from 3,071 in 1900 to 12,000 in 1906. At the same time, Greene County reached the height of its population with 36,000 citizens.

The town of Dugger (Sullivan County), which is less than a half-mile west of Redbird, was named in honor of Francis Marion Dugger, a civil war veteran who in 1882 opened one of the first coal mines in the area with his partner, Henry T. Neal. James B. Sherwood, who would later become a partner in Dugger's mining company, also had a vested interest in the Redbird area. John A. Templeton was another well known name in the history of Redbird.

Sherwood's influence in the coal industry reached to Chicago. He convinced Col. L.T. Dickason to purchase large amounts of land in the coal fields of Greene and Sullivan counties. The resulting mines operated for approximately two-and-a-half years before merging with the United Fourth Vein Mine. The United Fourth Vein was a consolidation of six companies located just north of present day Redbird. Parts of the Fourth Vein may have extended into the north edges of the property. The mine's daily output capacity was 6,000 tons of coal, an impressive capacity in that day of manual labor and minimal machinery.

In 1913, Templeton took over operation of Dickason's New Summit Coal Company. He with several others organized the Linton-Summit Coal Company which was the forerunner of the Templeton Coal Company. The five mines of the Templeton Coal Company remained in operation until 1954. In the meantime, Sherwood and Templeton joined forces in 1928 and established the Sherwood Templeton Coal Company. This merger of coal mine knowledge, perhaps genius, led to the formation of Redbird as we know it today.

Redbird was a part of two mines operating simultaneously on the same acreage. The Friar Tuck Mine was a surface (strip) mine operated by Sherwood Templeton Coal Company. The New Hope Mine was an underground slope mine operated by the Templeton Coal Company. This mining complex was active from 1929 to 1960, producing millions of tons of coal and numerous innovations that changed the face of coal mining.

Perhaps the most famous innovation was the first company-built power plant. The Antioch Power Plant was fueled by coal fines, sand grain-sized particles of coal, which was itself an innovation. Previously the fines were considered waste and were dumped with the mine overburden (soil that was moved to reach the coal vein). The Sherwood Templeton complex developed the furnaces that were able to burn the fines, another first. The plant produced enough electricity to power both mines and sell electricity to surrounding towns. Dugger was a non-electric town prior to the operation of the Antioch Power Plant.

Another first was the use of permanent processing facilities. The mines washed the coal prior to shipping it off site. The result of this process was hundreds of acres of slurry, which are the super fine coal particles that had no practical value at that time. Slurry ponds are still visible at Redbird today.

The companies also mined two coal seams simultaneously. Both No. 5 and No. 6 coal was mined from the Redbird site. The seams were located at different depths and have different levels of purity, this leads to multiple levels of spoils, tunnels, mixed refuse, and a conglomeration of mixed soils that are not normally seen. The Indiana Geological Society has studied the hydrology of Redbird for many years; they still cannot fully explain the results of their research (i.e., how the mining has affected the hydrology).

Additional innovations directly related to the mining operations included horizontal drilling for blasting overburden and the invention of the Baughman coal dryer. The coal companies also had some innovative reclamation ideas. Those ideas included the first use of coal reserves for farming and planting trees on coal spoils. Members of the nearby communities remember community projects that included planting pine trees at Redbird.

Friar Tuck, New Hope, and the Antioch Power Plant were located in what was commonly called “The Valley of the Tipples.” Tipples are the railway load-out stations for the coal companies. The mines at Redbird were served by two separate rail lines, the Chicago, Louisville and Indianapolis (Monon) and the Chicago, Milwaukee, St. Paul and Pacific (Milwaukee). The Monon entered the property from the east and served the Friar Tuck mine while the Milwaukee entered from the north and served New Hope. The rail tracks have long since disappeared, but the beds remain and provide an excellent foundation for roads and trails.

Very little remains of the old mining operations at Redbird; the Antioch Power Plant was razed in the 1970s, the tipples are gone, and the New Hope entrance has been filled in. A few partial structures are all that remain of an era of mining that reigned in central and southern Indiana. Unfortunately, the mining at Redbird also left many negative features. Tons of gob and slurry (coal refuse) were left behind. Although local citizens used the property for recreational purposes for many years after the mining, it was an unsafe place to be. Acid Mine Drainage (AMD) affected the water both on and off site, open piles of gob polluted the ground and water, mine tunnels remained open, and acres of slurry allowed AMD to run off into Mud Creek preventing any life to grow or flourish.

Redbird SRA has benefitted significantly from Title IV of the Surface Mining Control and Reclamation Act (SMCRA) which was passed by Congress in 1977 to establish national standards for mining and reclamation. Title IV provides for the environmental restoration of lands that were negatively impacted and/or inadequately reclaimed by mining operations prior to the enactment of SMCRA. The Department of Natural Resources (DNR), Division of Reclamation, Abandoned Mine Land (AML) section has invested more than $3.3 million to clean up the negative affects left behind by the mining operations. Numerous gob piles have been capped, entrances to underground mine tunnels have been filled in, and slurry has been neutralized and seeded, and water mitigation is an ongoing process. An additional $4 million to $5 million is expected to be spent in the future to mitigate AMD that affects Mud Creek. This project, in conjunction with a similar project at Minnehaha Fish and Wildlife Area, should return Mud Creek to an environmentally sound waterway.

In 1999, the DNR Division of Outdoor Recreation began purchasing tracts of land that were once a part of the Sherwood Templeton and Templeton Coal mining operations. By 2005, approximately 950 acres had been purchased and the Redbird State Riding Area (Redbird SRA), named after the Redbird Coal Company that mined west of Friar Tuck, was established. Redbird SRA was opened as Indiana’s first publicly owned off-road vehicle (ORV) riding area. It was managed from 2005 to 2008 by the Redbird Management Group, a volunteer-based organization devoted to the effective development and operation of the property. By 2008, the DNR had purchased an additional 600 acres of land, bringing the property total to approximately 1450 acres. By that time, the property had grown beyond the capabilities of the management group; therefore the Division of Outdoor Recreation contracted with the DNR Division of Parks and Reservoirs for Redbird SRA to be managed by Shakamak State Park. That arrangement remains in effect to this day with both divisions working cooperatively as Redbird is transitioning from a single-use to a multiple-use property.

There are many acres that are too fragile for off-road enthusiasts to use, although they can be used for passive and low-impact recreation. Redbird is a land steeped in the history of coal mining providing numerous educational opportunities for the local community and any others who visit. Its close proximity to Dugger makes it an ideal location for school field trips, family gatherings, and connection to bicycling or bike-pedestrian trails. The continued growth in visitation at Redbird and the transition from a motorized-use-only property to a multi-use property is the basis for this plan.

Jasonville Mine

Jasonville Miners

1.B Plan Development

The goals of this plan are to:

1. Provide direction for developing the property in a manner that sustains or improves recreational opportunities while protecting sensitive areas.
2. Offer guidance for stages of development.
3. Propose alternatives to the preferred design to mitigate unexpected barriers to implementation.

Several methods will be used to develop the Redbird Master plan. These include, but are not limited to:

- Review and research of pertinent information (e.g., similar recreation areas, topography, soils).
- Public and stakeholder input.
- Agency input.
- Internet and GIS research.
- On-site analysis and inventory.

Review and analysis of all information will be completed to determine at least two feasible alternatives for property development. The alternatives will be presented as preferred and secondary. Either will be qualified for implementation or, if necessary, a blending of elements from each may be implemented to meet the changing needs of the property, DNR, and visitors.

1.C Regional Analysis

Redbird State Recreation Area is located in Greene and Sullivan counties in west-central Indiana approximately 50 minutes southeast of Terre Haute. It is easily accessible from State Road 54 just east of Dugger. Travel to Redbird from metropolitan areas, such as Indianapolis, Evansville, and Chicago, is quick and uncomplicated due to Interstate 70, U.S. 41, and State Roads 59 and 54. See Figure 1: Regional Map with Driving Times.

There are many recreation facilities in the region. Most offer traditional recreation such as fishing, hunting, camping, hiking, and bicycling. Redbird is one of a few that allows off-road vehicle (ORV) use. The 2004 Nationwide Survey on Recreation and the Environment (NSRE) Update (2005) showed more than 22 percent of Americans participate in off-road driving. It ranks 10th in Western and Midwestern Metropolitan Residents' Participation in Nature-based Outdoor Tourism Activities (2005, NSRE update). The 2009 Indiana Outdoor Recreation Participation Survey indicates more than 30 percent of Hoosiers have participated in four-wheeling at least once a year, and more than 25 percent have driven an all-terrain vehicle for recreation. Some other activities that Redbird could provide include (with 2009 state participation percent in parentheses): gathering berries, mushrooms, etc. (49 percent); casual bicycling (56 percent); bank fishing (42 percent); outdoor photography (49 percent); pleasure driving and sightseeing (76percent); family and group gathering (91 percent); hiking (64 percent); and mountain biking (23 percent).

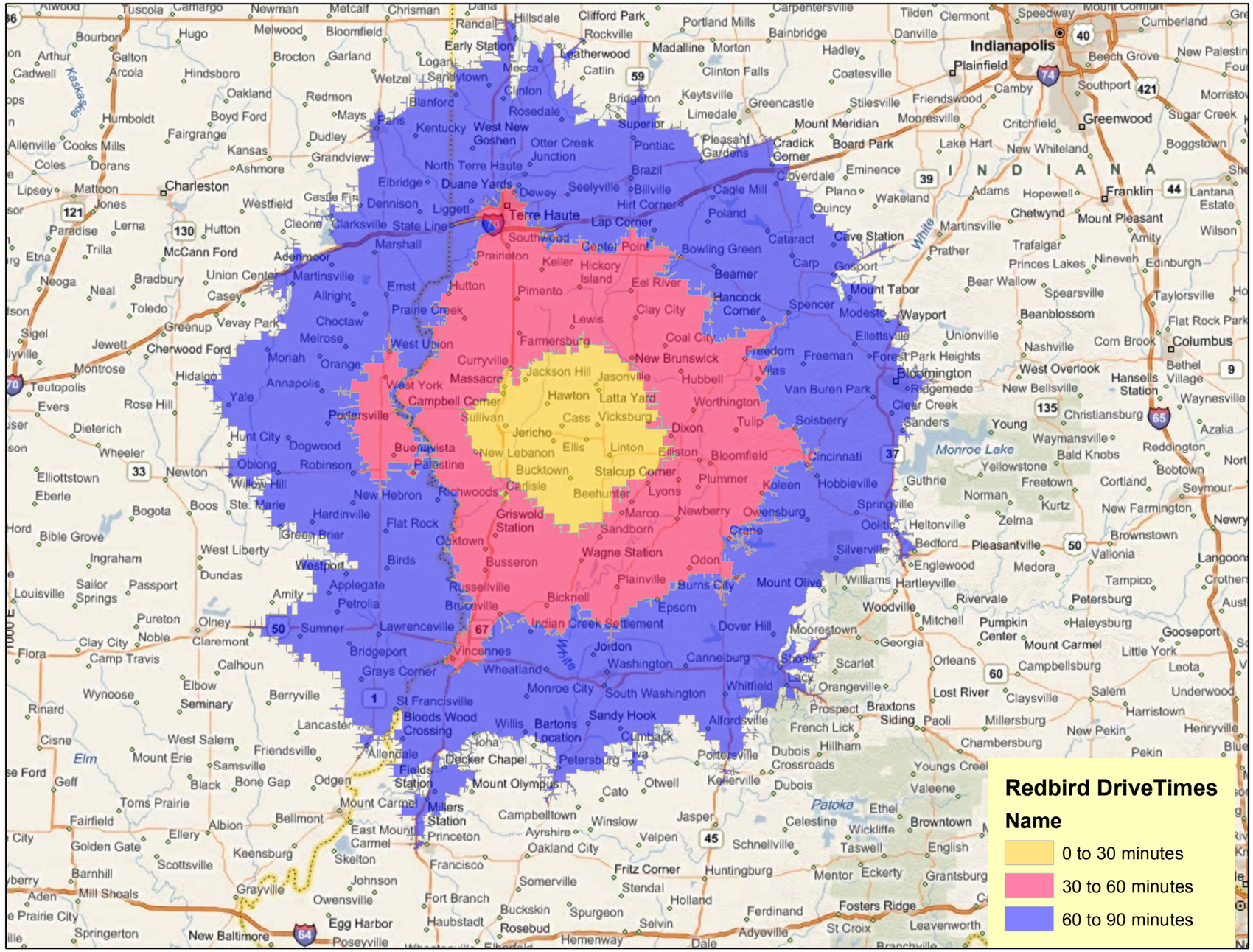


Figure 1.1: Regional Map with Driving Times

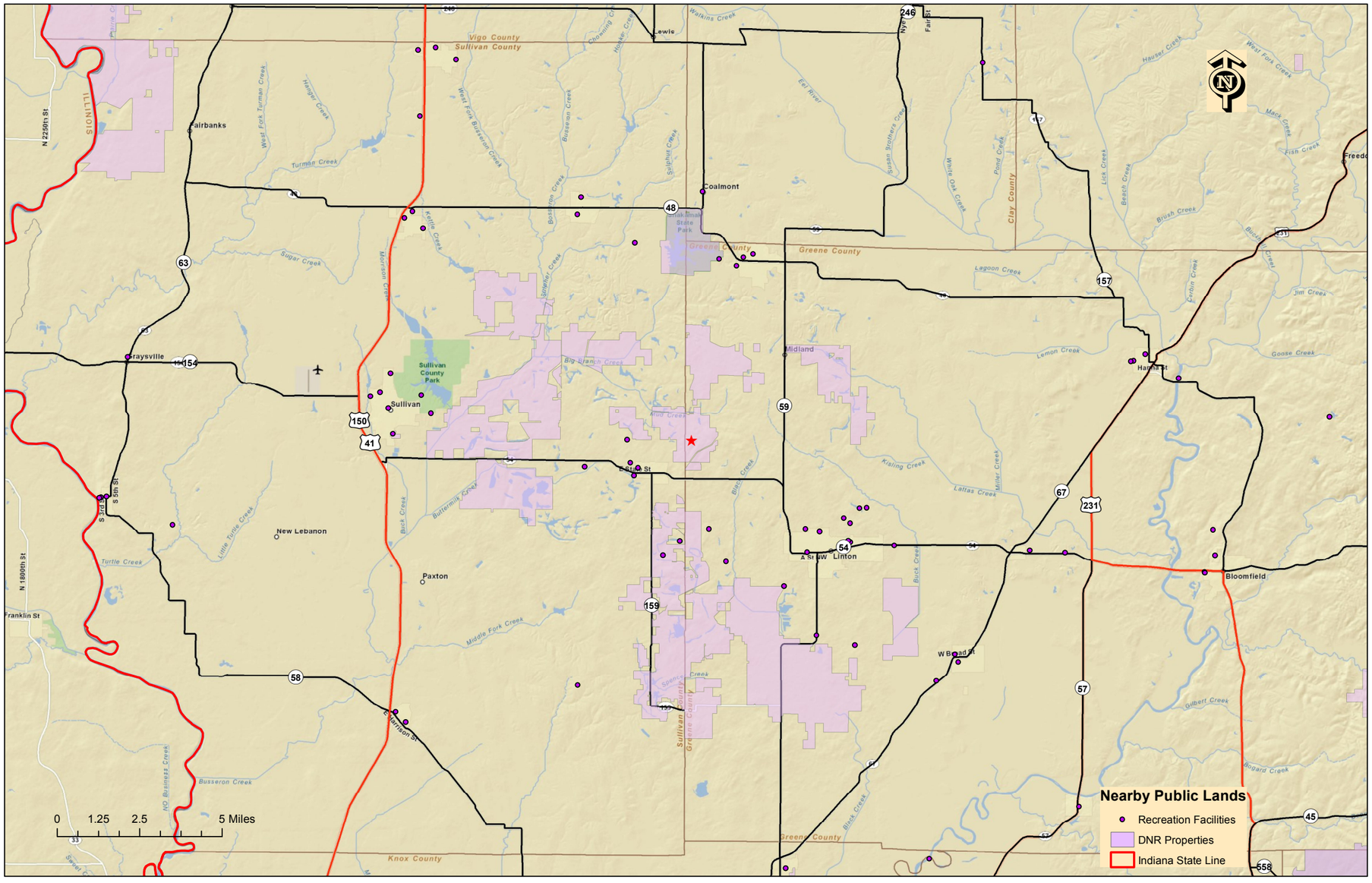


Figure 1.2: Nearby Public Lands

1.D Local Analysis

Greene and Sullivan counties have similar demographics with the following statistics being below national average:

- Average family size.
- Population with college degree.
- Population over 16 years in the labor force.
- Median household and family incomes. (U.S. Census Bureau, 2005–2009 American Community Survey)

Out of 92 Indiana counties, Greene County ranks 64th and Sullivan ranks 86th for per-capita personal income (2008, U.S. Bureau of Economic Analysis). And out of 599 Indiana towns, most of those nearby rank in the bottom 420 communities for per-capita income (Linton, 420; Dugger, 441; Jasonville, 587). The advances in technology in the mining industry and local production plants moving operations to other locations have had an obvious impact on the local economy and lifestyle. The low per-capita personal income can be an indicator that Redbird needs a larger visitor base than the local population to provide enough revenue to offset operational costs.

Non-motorized recreational opportunities abound in the area due to the high number of publicly owned properties such as Goose Pond, Hillenbrand and Minnehaha Fish & Wildlife Areas, Greene-Sullivan State Forest, Shakamak State Park, Sullivan Lake Park, and other county and municipal parks (see Figure 2). Redbird can build on the current opportunities by providing different types of facilities such as bike-pedestrian, interpretive, hiking, and mountain biking trails, and by increasing the number of motorized trail miles available for a variety of skill levels. These additional opportunities for both local and distant visitors can have positive economic benefits for both Greene and Sullivan counties.

1.E Natural and Man-Made Features

At one time much of Redbird was barren coal waste. Today the topography includes acres of spoils (hills left behind from surface mining operations), final cut strip pits (long, sometimes deep lakes), mixed deciduous forests, and coniferous forests that thrive on the acidic soils. There are less than 12 acres of ground within the Redbird boundaries that may not have been affected by surface mining. These acres are steep and rolling, but could be used for development. Many of the remaining open areas are within the AML reclamation project boundaries and constitute sensitive areas with use restrictions.

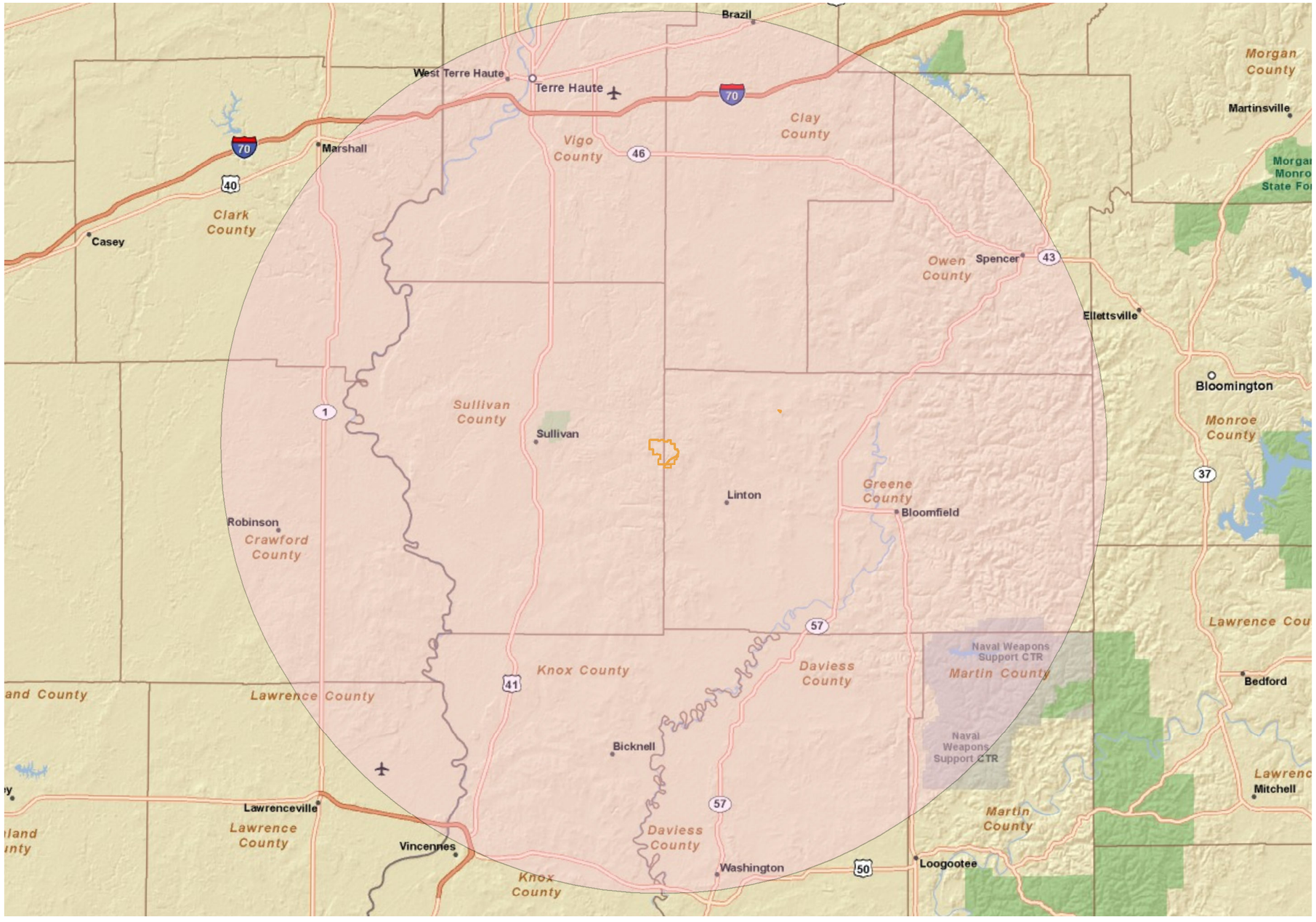


Figure 1.3: 30 Mile Buffer Zone

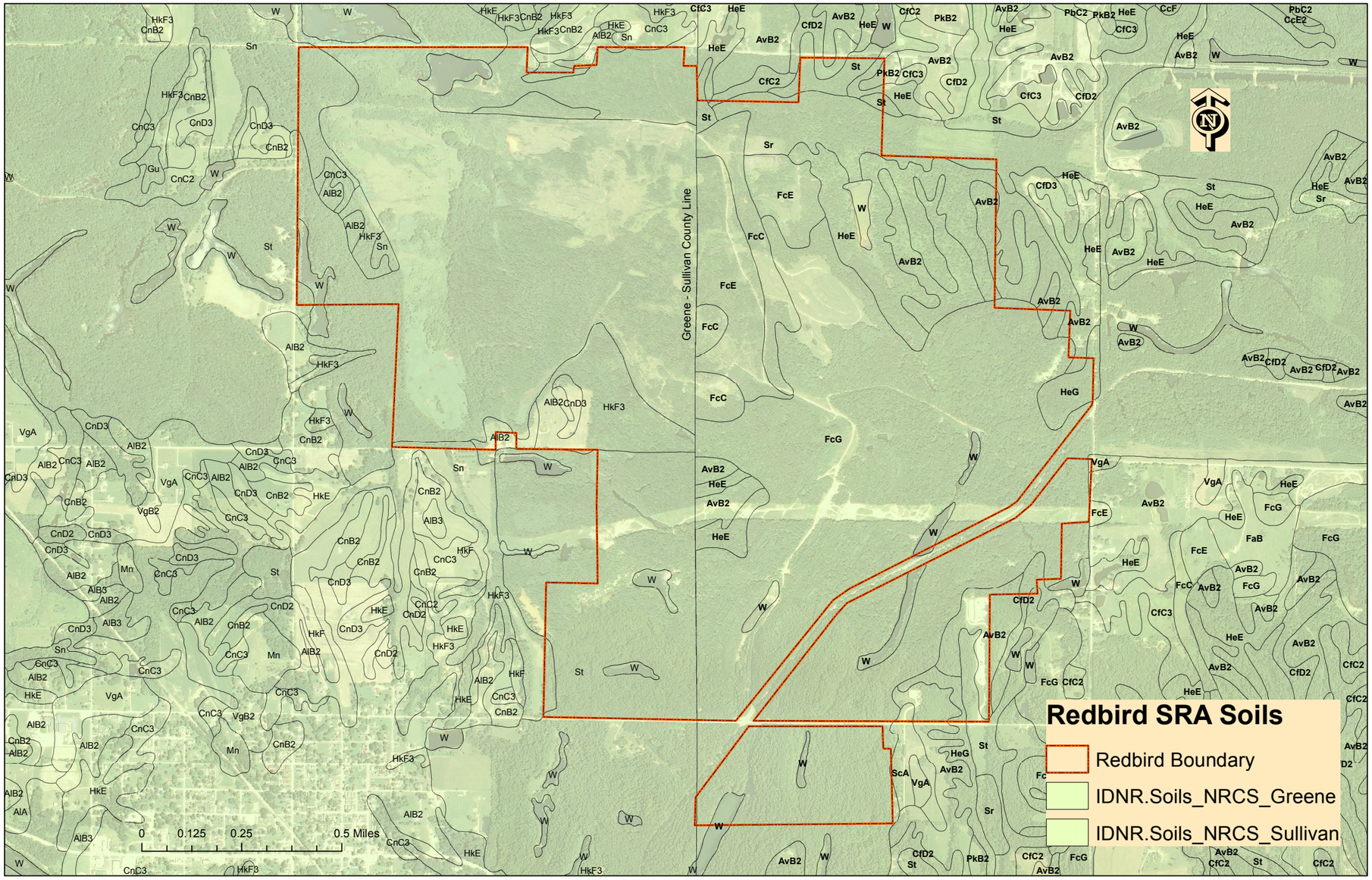


Figure 1.4: Redbird SRA Soils

1.F Soils

Due to the surface mining operations, the soils at Redbird have unique characteristics. During surface mining, the soils were dug out to depths of 80 to 125 feet. A long pit was dug to below the depth of the coal seam then the ground above the seam was dug and “flipped” into the pit. This resulted in the top soil being buried and the deepest soils being placed on the top of the spoil pile, leaving long hills or ridges of acidic, clay-like soils where limited vegetation could grow.

The vast, mixed soils and steep topography in the mined areas create special challenges and opportunities at Redbird. For example, there are few areas where the soils are conducive to drainage for septic fields; therefore, care must be taken in building placement or alternate treatment facilities must be constructed. Additionally, the steeply sloped spoils provide excellent trail locations if the trails are built to prevent erosion, which is an art in itself. Figure 4 shows the soils map of Redbird. For a complete USDA Natural Resources Conservation Services (NRCS) soils report see Appendix A.

1.G Man-Made Lakes and Lowlands

Water and water quality are other interesting features at Redbird. Most of the lakes and water features within Redbird's boundaries are the results of mining or reclamation. Many of the lakes or strip pits have good water quality and are acceptable for water recreation such as fishing and boating; although, a few that are near un-reclaimed coal waste areas or areas that need further mitigation are acidic (see Figure 5). The lakes that are not recommended for water recreation tend to be in areas of the property that are not frequented by visitors due to a lack of trails or roads near them. Several of the open drainage ways that start in gob piles and feed into slurry or Mud Creek are polluted with AMD. The affected waters have been identified for treatment by AML and are included in the scope of the next reclamation project (slated to begin in April 2013).

The majority of the lowlands are in the northern section of Redbird. These lands have a few trails through them; however, many of the trails are not sustainable and will be relocated as further reclamation is completed. The land north of Mud Creek may be altered to move the creek back to its original path of flow. This will increase the amount of acres in the flood zone, but will also restore habitat for many birds, reptiles, and amphibians.

There are additional wetlands and water systems throughout the property that are not affected by AMD or visitor recreational pursuits. Areas in the extreme southeast portion of Redbird are quite wet and may not be conducive to building development. However, interpretive trails may increase educational and recreational value.

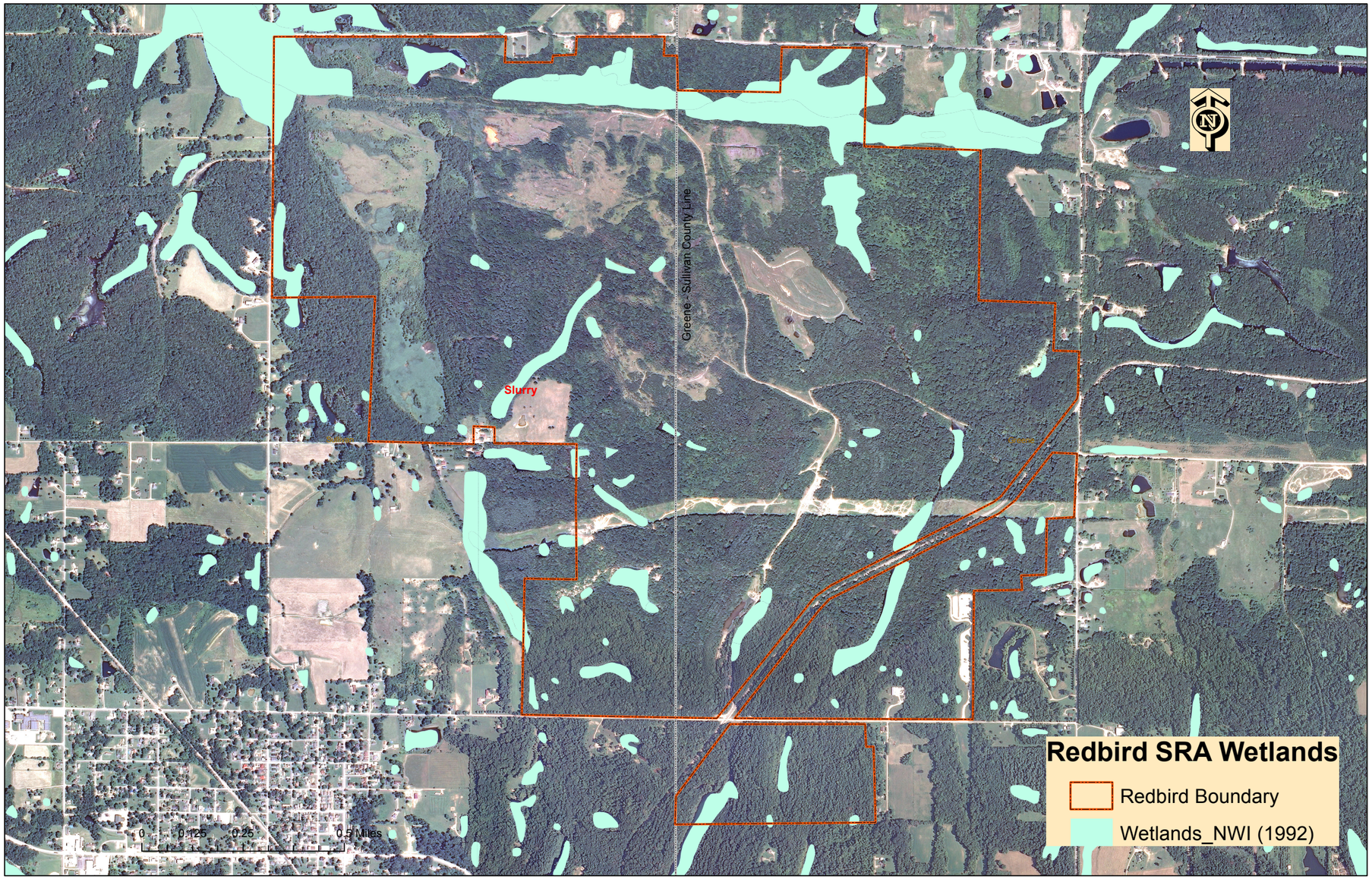


Figure 1.5: National Wetlands Inventory, 1992, Redbird wetlands including lakes and low lands.
Note: Some areas have been filled in through reclamation ("Slurry") and trail maintenance projects.

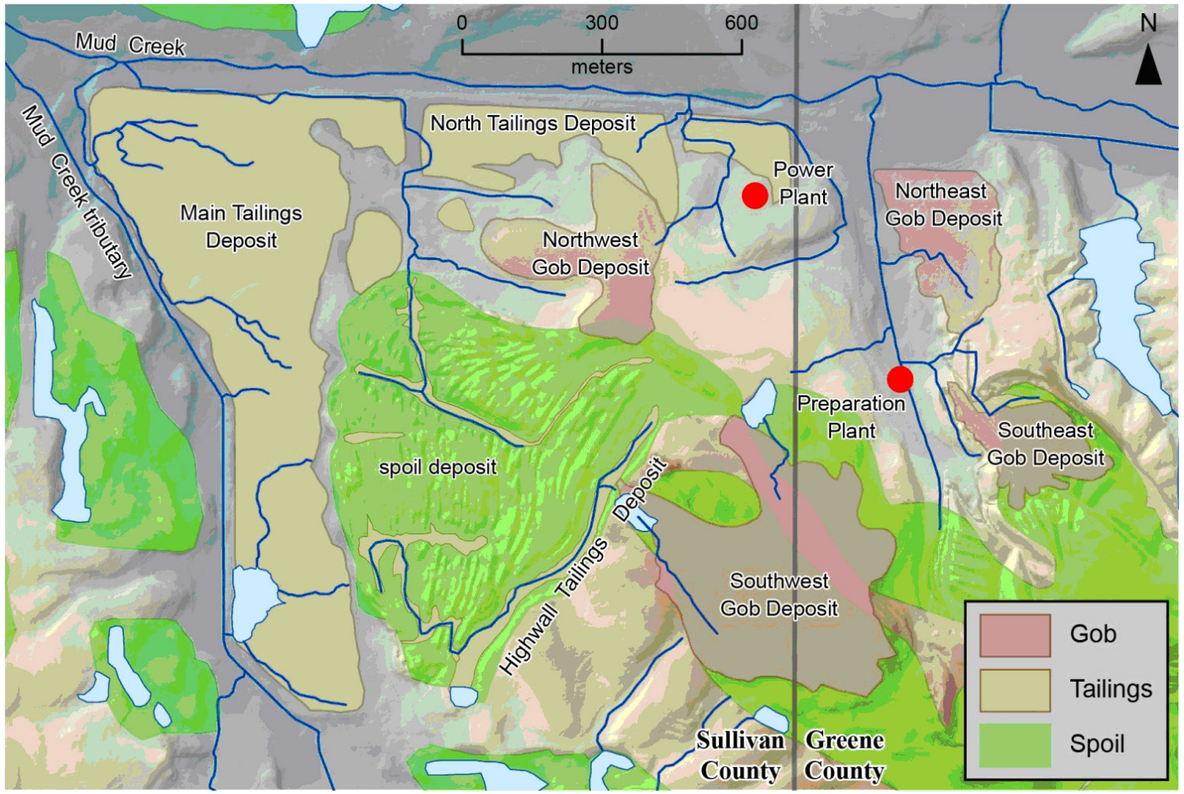


Figure 1.6: Slurry and Gob / Coal Waste Locations

1.H Woodland/Forests

Much of Redbird is tree-covered land. There are acres of established coniferous forests on the coal spoils in the south and central areas, as well as deciduous species throughout the property. The north and west sections of Redbird have more wetland type species due to the increased concentration of groundwater and lower land elevations. Some of the coniferous forests were hand-planted as part of the early reclamation of the land. Although the slopes are steep and the soils mixed, the trees thrive and provide both natural habitat and thrilling trail terrain. The trees help sustainability once a quality trail is established; they also provide shade, noise reduction, habitat, and visual barriers and anchors. Deer and turkey thrive in the forests, as do many small birds and other animals, such as squirrel, raccoon, possum, and skunk.

The understory at Redbird can be extremely thick with briers and shrubs, although there are many areas with lighter understory. These areas, found in the central, east, and west regions, provide cover and food for many smaller animal, reptile, and amphibian species. The lighter understory areas are also conducive to trails for larger vehicles, such as four-wheel-drive trucks and sport-utility vehicles. Other forms of recreation that would be acceptable in these regions include bird watching, mushrooming, hiking, mountain biking, and fishing.

1.I Grasslands

The grasslands at Redbird have been created through the reclamation projects. The approximately 200 acres of grasslands cover coal refuse or borrow areas. The coal refuse (gob and slurry/tailings) are located in the northern half of the property. There is also a small borrow area just north of the power line that bisects Redbird. This area may be enlarged with the upcoming reclamation efforts.

The grasses that cover the western slurry pond (main tailings deposit, Figure 6) are mainly native prairie grasses and forbs. Big bluestem, little bluestem, yellow coneflower, Indiangrass, and purple coneflower are a few of the species represented. The slurry was neutralized with lime then direct seeded. This method was somewhat effective, but did leave small areas of open coal refuse. Nature is slowly recovering the area with grasses, shrubs, and briers. There are some invasive phragmites in the wet areas.

Grasses also cover the gob piles (deposits) in the central region. Most of these projects required a greater amount of topsoil; therefore, the grasses are thriving. Some of the southwest gob deposit has been exposed through normal erosion and inappropriate trail use. These areas are being monitored and will be included in future reclamation. Additionally, some terracing was completed to control water runoff and maintain the gob restoration through time. The terracing has been highly effective, remaining in place and covered with vegetation.

1.J Land Cover, Recreation, and Planning

The National Land Cover Dataset map (Figure 7) is a good depiction of the flora at Redbird. The range of flora and fauna makes Redbird an interesting mix of both fragile and tenacious ecosystems. If managed properly a vast array of recreation, interpretation, and educational opportunities can be offered here. This broad collection of choices, which include off-road motorized recreation, helps provide for the creation of programs tailored to families, groups, and individuals with mixed interests. Redbird offers trails for a very specialized recreational activity that is extremely limited on publicly owned and managed lands in Indiana. It is this specialty niche combined with traditional recreation that makes Redbird a destination point.

It will be important for this master plan and property management to consider all the options when developing Redbird. The general perception leans toward separation of non-motorized and motorized recreation. Redbird's sensitive areas seem to point to this option as the preferred choice, but this may not be the case as it may limit the traditional recreation opportunity availability on the property. The soils, reclamation, hydrology, and topography do indicate that motorized recreation should remain in the southern two-thirds of the property but do not indicate that limiting low impact is necessary. Other properties have successfully offered and managed these activities on mixed-use trails or within close proximity of each other. There are many areas of Redbird SRA where traditional recreation, such as hiking and mushrooming can occur simultaneously with motorized without conflict of interest or safety concerns. This division of use allows the property to continue to focus on its original goal and mission of providing ORV recreation on publicly owned property and expands the vision to include multiple opportunities for additional growth and recreation.

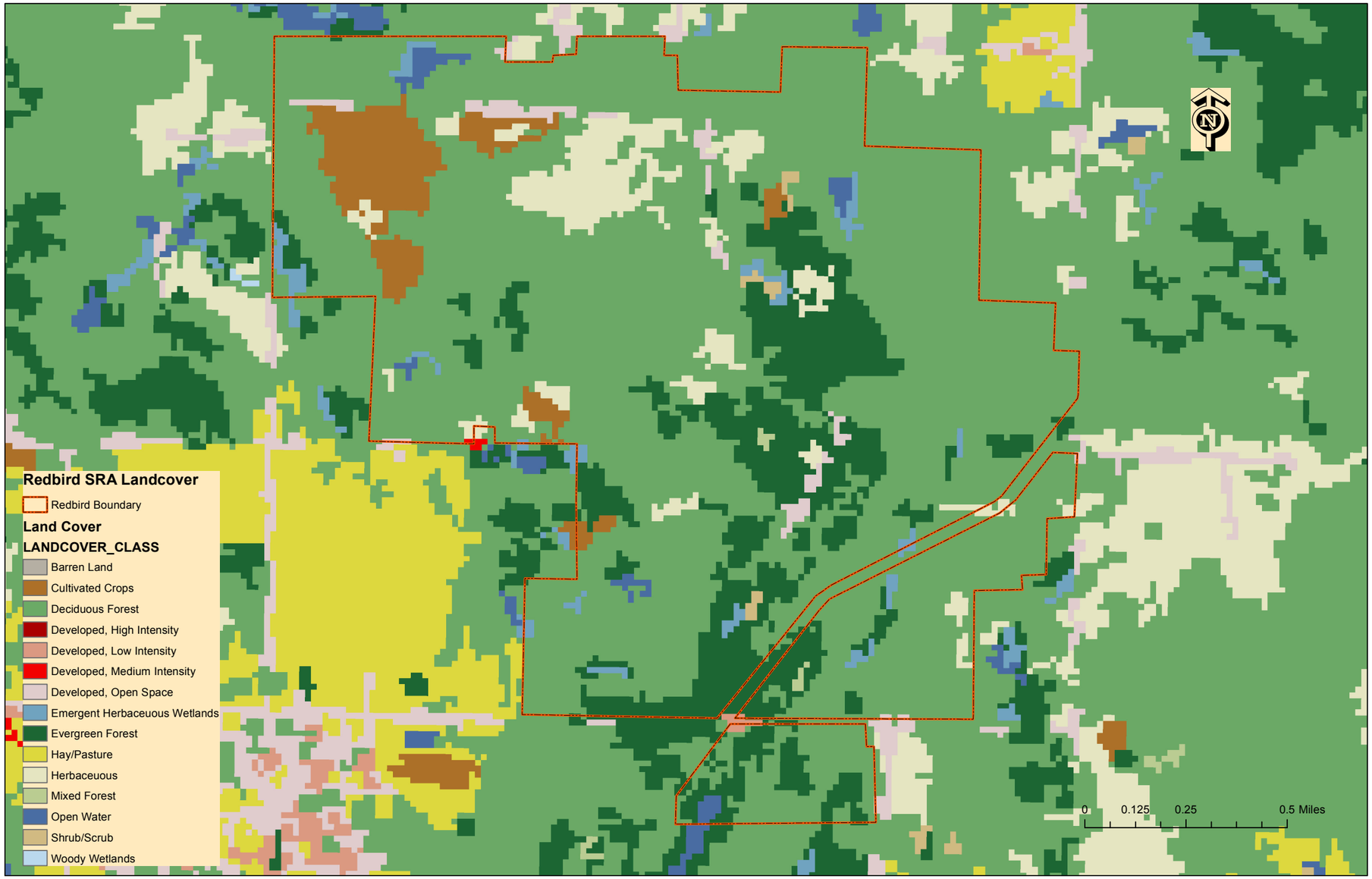


Figure 1.7: Land Cover, 2001 National Land Cover Dataset & Hydrology Basemap
Note: Grasslands established via AML are depicted as "Cultivated Crops".

1.K Interstates and State Roads (see Figure 1)

I-70 is the closest interstate to Redbird. To the west, I-70 connects Terre Haute, Ind., to St. Louis, Mo., (approximately 170 miles); and to the east, it connects Brazil, Ind., to Columbus, Ohio, (approximately 236 miles). I-70 intersects with U.S. 41 (Terre Haute) and State Route 59 (Brazil). The closest interstate to the south is I-64, just north of Evansville, approximately 75 miles south of Sullivan, Indiana. I-64 intersects with U.S. 41 just east of the Indiana state line. U.S. 41 and State Route 54 intersect at Sullivan; State Route 59 and State Route 54 intersect three miles west of Linton. State Route 159 connects to State Route 59 south of Linton, near Goose Pond FWA then travels west and north to Dugger, where it connects to State Route 54. These (State Routes 41, 59 and 159) are direct routes to State Route 54 and the Redbird entrance.

State Route 54 is a well-traveled, two-lane highway that connects U.S. 41 to Bloomington, Ind., (via State Routes 445 and 45). It also connects Sullivan, the Sullivan County seat, and Bloomfield, the Greene County seat. Traffic can be heavy during morning and evening rush hours as it is one of the main routes to Crane Naval Center and other leading employers in the region. Being a main artery in the area, the road has a smooth, straight, easily traversed segment from Bloomfield to U.S. 41.

1.L Local Roads

The local roads (Figure 8) closest to Redbird are a mix of paved and gravel roads. The north-south roads in both counties are paved, while the east-west roads are mainly gravel or chip-and-sealed with paved sections through residential areas. The conditions range from acceptable to quite rutted and difficult to traverse. The counties maintain the roads as time and funding allows; however, the conditions will vary throughout the year.

Sullivan County Roads

- *CR 800 E* is located on the west side of Redbird and is a partial boundary for the northwest corner. It connects to State Route 54 in Dugger, CR 50/Monroe Street, East Center Road, and CR 100 N. CR 800 E is paved, easily traversed, and a main connector to Redbird via CR 50.
- *CR 50/Monroe Street* (continues in Greene County as CR 350) is the first east-west road north of State Route 54. It is paved to just east of Dugger's limits, then is gravel/chip-and-sealed. This road is nice through areas with residences, but can become quite rutted and difficult to drive between Redbird's west boundary and entrance, especially at the railroad crossing. CR 50 pro vides access to the Redbird entrance from the west.
- *East Center Road* is a paved east-west road a half-mile north of Dugger. It dead-ends at the west property boundary and is maintained better than CR 50.
- *East CR 100 N,* which becomes CR 500 in Greene County, bounds the north side of Redbird in Sullivan County. The road is paved and remains in good condition. A former access to Redbird and abandoned rail line (the rail bed remains evident) intersect with CR 100. The former access is gated and could become a small parking area for bird watching or wildlife viewing at the future wetlands site north of Mud Creek.

Greene County Roads

- *CR 1500* is a north-south road that connects to State Route 54 and CR 350 providing access from the east to Redbird's entrance. The road continues north and is part of the east property boundary. CR 1500 is paved with some rough areas, but is easily traversed. This is the signed main access to Redbird.
- *CR 1550* is a paved, but very rutted and rough north-south road that connects to State Route 54 and CR 350. This road has one sharp S-turn in the half-mile stretch north of State Route 54 and dead-ends at CR 350 directly across from the Redbird maintenance area entrance.
- *CR 350* is a chip-and-sealed, east-west road that dead ends at CR 1500, and becomes CR 50 in Sullivan County. An approximate 1/3-mile segment of the road divides the northern section of Redbird and about 90 acres of land to the south. This is a concern for the DNR because it is necessary to cross the road to access dirt bike trails in the southern area. Redbird's entrance is approximately 1/4-mile west of CR 1500. The road is somewhat rough with several potholes but is maintained fairly regularly allowing for normal travel.
- *Note: County roads 1500, 1550, and the segment of 350 between them have been identified by Indiana Department of Transportation as roads to be paved for park access. This type of project can take 10-12 years to complete and may be postponed due to major projects, such as the I-69 corridor.*
- *CR 400* is an east-west road that connects State Route 59 to CR 1500. It is an easily traveled straight route that ends at the property boundary (CR 1500), just under 3/4-mile north of CR 350.
- *CR 500* is along the north Redbird boundary and becomes CR 100 in Sullivan County. It is paved and easily traveled, connecting State Route 59, CR 1500, and Sullivan CR 800 E.

1.M On-site Roads

Within the Redbird boundaries are several former mine roads. These roads, which are still evident, provided employees access to the mine entrance shafts/tunnels and to other areas of operation, such as the wash stations and tipples. Some of these roads have solid foundations and will be used in either the trail system or the park road system. Others will be re-established during the next reclamation project, and then integrated into the overall park system. The remaining former roads have been disrupted enough by rail line improvements and subsidence that they will not be improved and will become a part of the natural environment.

At this time, there are no established park roads. Suggestions for road locations will be addressed in this plan.

1.N The Indiana Rail Road Company

An active section of the Indiana Rail Road Company rail lines bisects Redbird. This line effectively separates over 150 acres from the rest of the property. There is no legal crossing within the property boundaries; therefore, property visitors must exit the trails onto CR 350 to cross the tracks, then re-enter the property at Trail 0. This is a legal and safety problem for under-aged and non-licensed drivers, and makes it difficult to secure the boundary to prevent unauthorized access. Previous discussions with the Indiana Rail Road Company to establish a crossing within the property have not been successful. At the time of this writing negotiations have been initiated by the DNR executive staff team and a positive resolution is expected. Additionally, results of agency and public meetings indicate a desire for the State to take over (or vacate) CR 350 from CR 1550 west to the Greene County line. This will be discussed later in the plan.

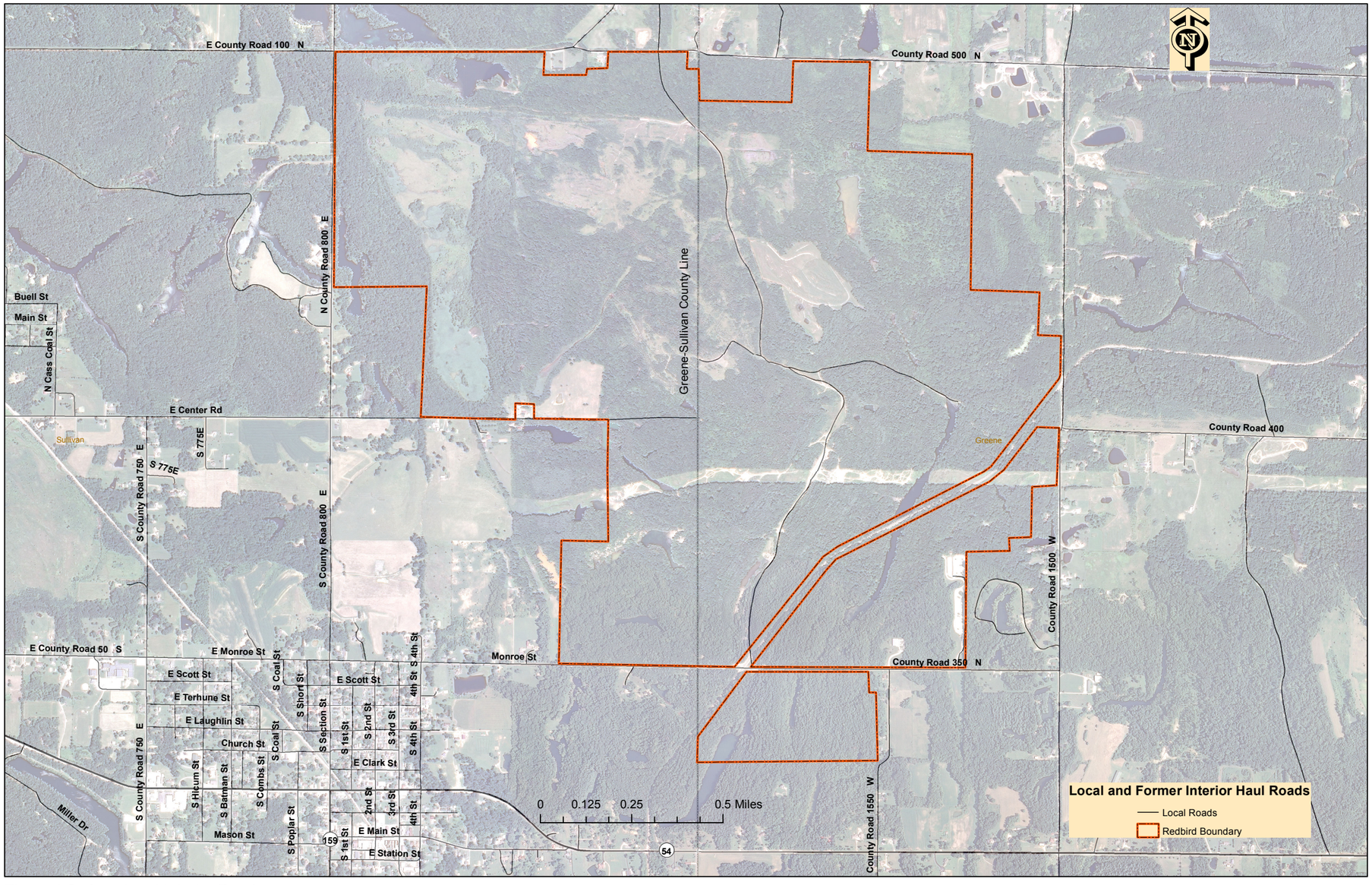


Figure 1.8: Local and Interior Roads

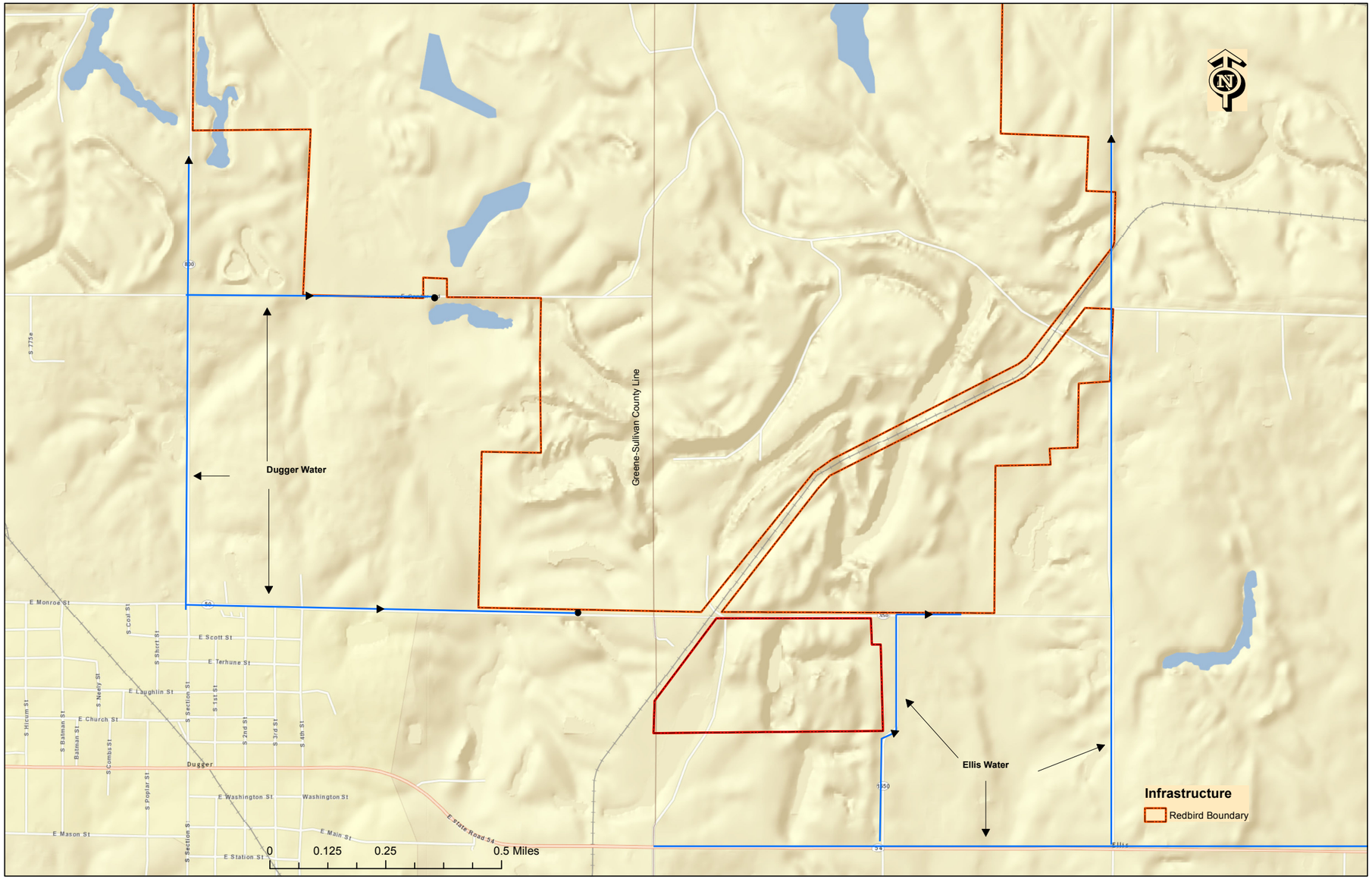


Figure 1.9: Infrastructure Near Redbird

1.O Infrastructure

The backbones to build solid infrastructure within the property are in place for future development. Redbird is currently served by utilities based in Greene County, Ellis Water Company and Greene County REMC. Dugger Utilities, in Sullivan County, provides water to land owners to the south and west of Redbird and could provide service to Redbird in the future without major line upgrades (see Figure 9). Greene County REMC did not have electric service line maps available; however, providing any level of service necessary to meet Redbird's needs should not be a problem.

Currently, Ellis Water has a 4-inch main that parallels State Route 54. Two-inch mains extend north along County Roads 1500 and 1550. The main along 1500 extends well north of the Redbird boundaries and could be used if necessary to bring water into the eastern portion of the property. The main that runs along CR 1550, extends east along CR 350 for 100 feet. The Redbird meter is 25 feet east of 1550 and the main is capped. Ellis Water configured this main so it could be extended easterly to provide service to the Redbird parking area. There is a flush hydrant on the southwest corner of the CR 350 and CR 1550 intersection that cannot be used for fire suppression, other than to fill tanker trucks. The main along CR 350 was extended to the Redbird parking area during the writing of this master plan.

Dugger Utilities has a main that runs north along CR 800 E. A 4-inch main provides service along CR 50/Monroe Street to the last residence west of the Greene-Sullivan county line. There is also a 4-inch main that runs east from CR 800 E along Center Road; the main terminates at the last residence, which is just west of Redbird's boundary. Either main could be extended further east to provide water to Redbird.

1.P Conclusion

Much of Redbird is bounded by county roads (Figure 8) and it is within two miles of three state highways (State Routes 54, 59, and 159). The current property entrance is less than one mile north of State Route 54. Sufficiently sized water mains are available near Redbird's boundaries and could be extended to provide further service to the property. Electricity is available; lines can be installed when needed to provide service.

Recreation Analysis



Section 2: Recreation Analysis

2.A Recreation Participation Trends

Redbird is one of many unique outdoor destinations that have catered to a specialized recreationist. Redbird's recreational specialization has been ORV trails. But, motorized recreation is not the only draw at Redbird and certainly the property usage should not be restricted to that. There are many areas and acres for other activities such as mushrooming, hiking, mountain biking, fishing, and picnicking. A comparison of the potential recreational opportunities at Redbird and the results of national and state studies will help to narrow the focus to activities that recreationists are currently participating in and would like to continue. Table 1 shows the statistics from the national and state research for outdoor recreation participation that is pertinent to Redbird.

2.B National Changes

National trends in recreation have been studied since 1999 using the National Survey on Recreation and the Environment (NSRE). The random dialed telephone interview survey is conducted by the U.S. Forest Service in partnership with the Universities of Georgia and Tennessee. The survey is conducted in rounds with the goal of updating information about 60 outdoor activities for every state on a five-year cycle. The latest rounds were conducted between summer 2005 and spring 2008.

The national updates completed in 2008 show a 4.4-percent growth in recreation participation and a 25-percent increase in number of days of participation (Cordell, 2008). Additionally, it showed some of the more traditional activities are becoming less popular, while participation in non-traditional activities is growing.

2.C Indiana Statistics

The Outdoor Recreation Participation Survey is conducted every five years under the supervision of the DNR. The results are used to guide the State's Outdoor Recreation Master Plan and to give managers of all recreational facilities and programs evidence-based information for sound decision making. The 2009 survey was conducted at various venues throughout Indiana from May 2009-August 2010 with 6,824 usable responses.

Excerpted results from the national and state participation statistics are compared in Table 1: Outdoor Recreation Participation. Table 1 has been limited to reporting several activities that can be included in Redbird's normal operations. Although the activities are listed in order from the State survey by Percent Participated More Than Once per Week, for a multi-use property such as Redbird it is important to consider total participation. There may be times when the property lends itself to blending of several activities to draw a larger customer base. For example, Redbird is an ideal location for visitors to ride ATVs to areas that are perfect for gathering mushrooms or berries. It also can promote pleasure driving and fall foliage viewing. Whether considering individual activities or combined recreation the data suggests people will be attracted to a multi-dimensional concept for the property.

2.D Redbird State Recreation Area

Since Redbird has opened as a multi-use property on January 1, 2011, visitation and revenue have markedly increased. This increase is due in part to the additional items available for purchase such as annual entrance permits, off-road vehicle registrations, and lake permits. However the increase in customers, particularly early in the year, can be attributed more to other activities such as fishing and mushroom hunting. Monthly off-road events hosted by the Redbird Foundation have also seen an increase in attendance which has contributed to the improved usage numbers.

Redbird has not seen a large number of improvements or additions to increase customer appreciation and loyalty. Therefore it can be inferred that the main draw, at this time, are the outdoor activities. Additional amenities (e.g., shelters, vault toilets) are currently being built/installed and there are plans to install potable water in the parking area. This master plan will include recommendations for additional amenities that should increase the attractiveness of the property for a more diverse customer base.

	Indiana Percent Participation Rate – Current (2009 Outdoor Recreation Participation Survey)								NSRE National Study	
Activity	***More than once/ week***	***Once a week***	***Twice a Month***	***Once a Month***	***Couple times per year***	Once a year	***Total who participate at least once per year***		***Percent Change in Participants 1999-2001 to 2005-2008***	***Percent Change in Total Days 1999-2001 to 2005-2008***
Walking (for exercise / pleasure)	46.7	17.6	8.0	7.1	7.5	1.9	88.8		9.6	13.9
Gardening / landscaping	26.7	15.0	9.9	6.8	13.1	4.3	75.7		–	–
Jogging / running	24.2	11.0	5.5	3.8	7.3	2.1	53.8		–	–
Relaxation / spiritual renewal	21.0	16.2	6.1	5.8	9.0	4.4	62.4		–	–
Family/friends/group gatherrings	19.4	18.0	15.3	16.8	17.7	4.5	91.6		4.2	13.7
Bird Watching	17.7	7.1	3.7	4.0	7.4	2.7	42.4		19.3	37.6
Fall foliage viewing*	16.2	7.4	5.2	4.2	22.0	12.8	67.8			
Wildflower viewing*	14.7	7.8	4.3	7.1	10.8	5.2	49.9		25.8	77.8
Pleasure driving / sightseeing (car / motorcycle)	14.3	13.6	10.2	14.2	18.5	4.9	75.8		3.1	-1.1
Casual bicycling	13.5	10.3	6.5	7.4	14.5	3.6	55.8		7.7	–
Health related activities (Yoga, Tai Chi, Pilates, etc.)	12.5	5.9	3.8	4.8	7.7	4.2	38.8		–	–
Playground use	11.9	8.1	8.2	7.6	13.2	3.4	52.5		–	–
Outdoor Spectator sports	9.5	6.7	6.4	9.0	22.1	6.7	60.4		–	–
Hiking	6.8	4.6	4.7	7.7	29.1	11.2	64.1		6.8 (day hking)	-20.9
Fishing in ponds	6.8	3.7	5.1	5.8	18.8	6.9	47.0		7.3 (warm water fishing)	5.6
Visiting parks, wilderness or primitive areas	6.1	5.3	9.5	12.6	34.8	11.6	80.0		3.0	12.8
Gathering (berries, mushrooms, etc.)	5.9	3.3	2.9	4.2	23.9	8.0	48.3		16.1	1.9
Picknicking**	5.6	5.2	8.7	14.4	34.0	9.4	77.3		-1.4	-17.2
Fishing (lakes, reservoirs)	5.4	4.4	5.9	7.4	15.7	8.2	47.0		-2.1 (cold water fishing)	-7.0
ATV's	4.9	3.4	2.5	3.5	7.7	3.8	25.9		18.6 (drive off road)	56.1
4-wheeling	4.5	3.8	3.0	4.3	10.1	4.9	30.5		(see ATVS)	(see ATVS)
Lawn games (badminton, Bocce Ball, etc.)	3.3	4.1	5.4	6.6	21.4	5.5	46.3		–	–
Attending fairs / festivals***	3.2	1.6	5.7	10.7	46.8	13.5	81.6		–	–
Fishing from boats	3.1	2.1	3.4	4.5	11.6	7.9	32.6		–	–
Visiting historic site, interpretive centers, etc.	1.4	0.9	3.3	6.9	36.7	19.9	69.1		**-4.5**	-15.2
Sledding / toboganning*	1.1	0.3	0.9	1.3	25.8	16.1	45.5		-6.5	–

Figure 2.1: Outdoor Recreation Participation

* Seasonal recreation

** May not include picknicking as an auxiliary activity to other primary recreation (e.g., picknicking during a family gathering)

*** May correlate to attending special events related to other recreation (e.g., attending outdoor spectator sport that is part of a cultural festival)

– No information available

2.E Conclusions

Both national and state research indicates a shift in outdoor recreation participation away from some traditional activities (such as picnicking, day hiking, and some types of fishing) toward non-traditional activities such as driving off road, wildflower viewing, and bird watching. Observation of activities of Redbird's visitors indicate the same holds true there, visitors are prone to gather with friends and family and engage in non-traditional activities with varying degrees of difficulty. However, Redbird is an ideal location to blend traditional and non-traditional recreation. Property managers tend to blend the survey data with personal observation to guide them toward primary capital projects that merge traditional and non-traditional activities. The result of this well-rounded approach is a facility that caters to visitors of all ages and cultures. Redbird should follow this pattern.

Redbird has the topography, natural resources, and potential to meet the needs of a range of recreation types from passive to extreme. The reclaimed lands provide exceptional locations for bird watching, family/group gatherings, events such as fairs/festivals, and casual biking on accessible hard surface trails. The coal spoils provide excellent terrain and vegetation for off-roading, mountain biking, trail running/hiking, and mushrooming. Additionally, there are quality fishing lakes that can be reached using a street-legal (stock) vehicle, an ORV, or by walking. The purpose of this plan is to provide a guideline for developing Redbird to its highest potential while meeting the needs of a variety of visitors and retaining the integrity of the natural resources.



Section 3: Plan Development and Implementation

3.A Public Input and Ideas

The Division of Outdoor Recreation held a public meeting March 29, 2011, and attended the Greene and Sullivan county commissioners meetings to present the preliminary plan concept and hear the public's comments about it. The meetings were also held to gather input on three main barriers to the development of the property. Those barriers are:

1. An active railroad bisecting the property with the only legal crossing being outside of Redbird's boundaries requiring all vehicles to exit then re-enter the property to reach the trails west of the railroad. The majority of the trails are in the western two-thirds of the property.
2. An open county road divides the property. There are approximately 100 acres of land south of CR 350 with well designed and used dirt bike trails and quality mushroom-ing areas. Visitors must cross CR 350 to access these acres.
3. The current entrance is on the southeast corner of the property away from the majority of the trails.

All of the barriers listed above lend to problems such as unauthorized access, non-licensed drivers using the county road, safety concerns, and excess damage to the road and roadsides from extreme treads.

3.B March 29 Public Meeting

Carman Jackson, Redbird project manager, led the public meeting by presenting a brief history of the property, outlining the challenges that are faced in development (particularly in regards to use of the reclaimed acres), and defining the three major barriers to development. The audience was then asked to divide into groups of equal number and, mixing with other organizations that were present, to brainstorm and record comments and ideas. Once ideas were recorded, each group gave a brief presentation of their comments, then comments were consolidated, and the audience was asked to priority vote using a dot system. The dot system consisted of each attendee receiving five dots to vote on any item in the consolidated list. The person could spread the dots among ideas or place all dots on one. Attendees were encouraged to vote on at least two items to help prioritization. The consolidated list in priority vote order is:

1) Acquire CR 350 in Greene County from CR 1550 west.
2) Keep entrance near CR 350 and CR 1550.
3) Have separate parking for motorized and non-motorized use.
4) Install additional restrooms.
5) Build entrance on west side of property (Center Road).
6) Build additional shelters.
7) Provide for and allow camping.

Comments that did not receive votes are not listed here. See Appendix B for full results and vote count.

The justification for acquiring CR 350 from CR 1550 to the west Greene County line was, in part, that it would take care of the three major barriers in one move. The road would become a park road which would allow crossing the railroad tracks and access to the south acres within the park boundaries. Additionally, visitors are accustomed to the entrance, road signs are already in place, and it would still connect to the proposed main park road.

The home owner at CR 350 and CR 1550 prefers the entrance to stay there because he has started a small vehicle repair business on his property. Also, informal talks with neighbors on Center Road indicate that they prefer the entrance to remain on CR 350.

One of the limiting factors for comments accepted at the public meeting is that most attendees were off-road enthusiasts; therefore, comments are skewed. The south entrance is located closest to the ORV areas and connector trails are already established. That being said, the comments of consolidating solutions to barriers into a basic one step resolution are valid and should be considered.

3.C Greene and Sullivan County Commissioners

A brief overview of the master plan and project was presented to the county commissioners in separate meetings on June 20, 2011. Both meetings included requests for input concerning the property entrance location. In response, Greene County Commissioners stated they would like to keep the entrance in Greene County. Sullivan County Commissioners and highway personnel were concerned that moving the entrance to Center Road would create difficulties such as: (1) Entering the property from a dead end road; (2) Vehicles leaving the property would track mud onto the road; and (3) If the pavement was not maintained (or reverted to gravel by the county) it would discourage visitors or create other problems.

The Greene County Commissioners also commented that:

- The property will need more staff as it develops and visitation increases.
- Special events could draw a larger audience and increase property and local tourism revenue.
- The access and interior roads will need to be improved.
- Marketing to other states would be beneficial.
- Fees for events would be good.
- There have been some complaints about the traffic, but nothing of a major concern.
- Vendors (food or otherwise) could be a positive addition.

In summary, Greene County Commissioners were more receptive to having an entrance in their county and could see an economic benefit to the development of the property. Sullivan County Commissioners were more neutral.

3.D Additional Comments

Additional comments were accepted through phone calls and e-mail. Two phone comments were received, both discouraging the development of a west entrance. One adjacent land owner also had concerns about policing the property boundary, especially in areas where the boundary cuts through lakes.

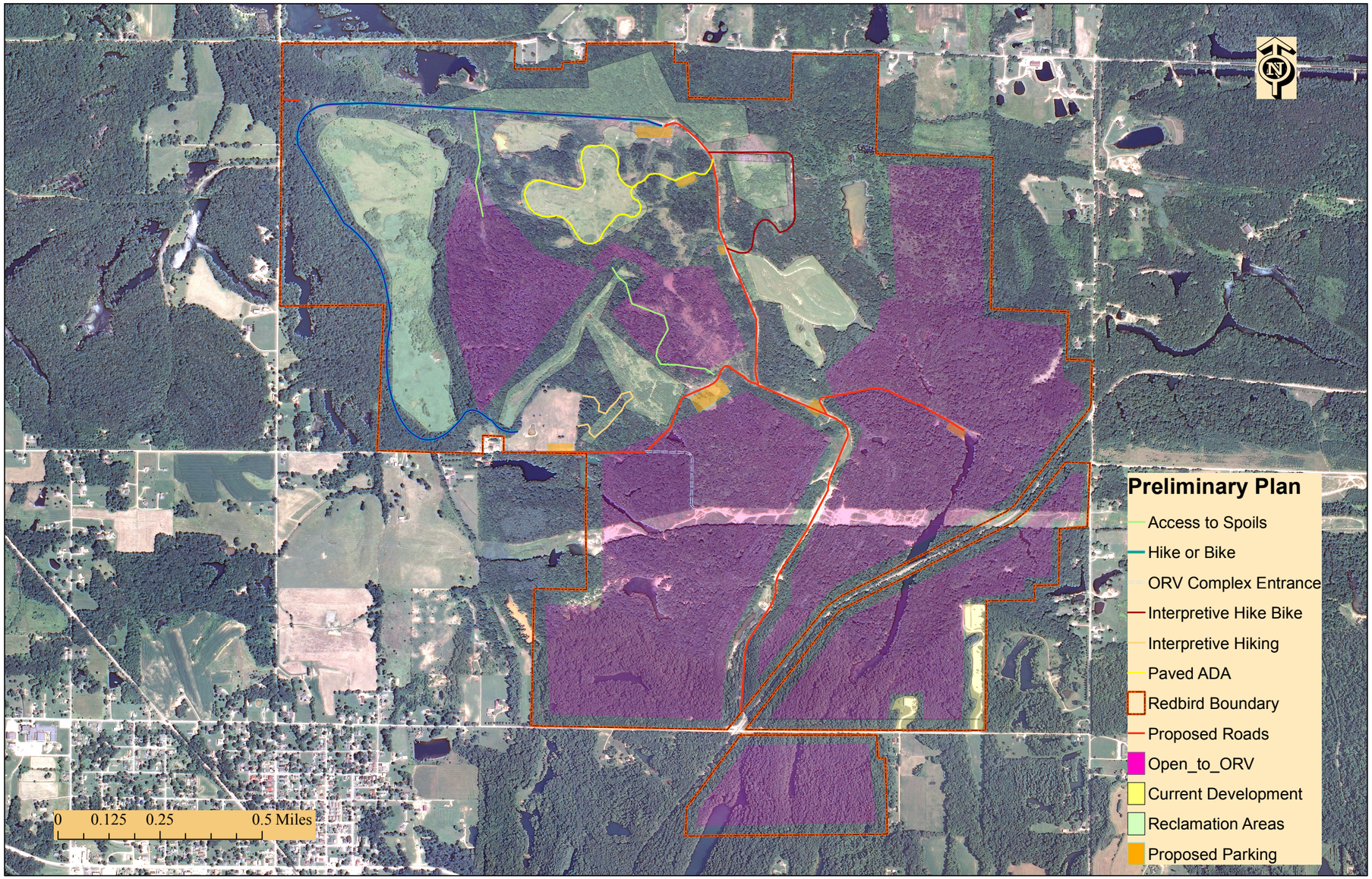


Figure 3.1: Preliminary Plan

3.E Plan Concepts

The plan concepts that were presented at the public and commissioners meetings were basic outlines of what could happen. This was an intentional move to encourage comments and suggestions from outside sources. The plan that was presented is shown in Figure 3.1: Preliminary Plan. Additional plans have been developed and refined for the Division of Outdoor Recreation's review based on the comments and suggestions received. Changes to the preliminary plan include increasing the acres available for off-road trail development, acquiring CR 350 in Greene County, and development of a western entrance for emergency- and maintenance-vehicle use only.

Both plans include a central spine road system which is the most feasible solution for this property. The linear out-and-back road system is preferred over a loop system due to the areas of reclamation that need to be avoided, topography around most of the perimeter would require extensive dirt work, and the high potential for uncovering coal refuse while establishing the road.

3.F Current Facilities

Redbird's current entrance and parking facility covers approximately nine acres, four of which is stone parking lots (including driving lanes, loading ramp, and islands); this 174,240-square-foot parking lot should accommodate up to 125 trucks with trailers. The public entrance area also has restroom facilities and a small picnic shelter. Potable water should be added to the area in the near future. The maintenance area is approximately 2.3 acres; it includes the maintenance/office building, parking for employees, and a small detached storage building. Both of these facilities are located on the southeast corner of the property. The remainder of the facilities includes a 20-by-30-foot picnic shelter and a small parking area with vault toilet which are under development near the middle of the property. Redbird does not have developed roads, electric, potable water, or non-motorized recreation facilities available for visitors at the time of this report.

3.G Central Spine Road System

A central road system is the most feasible for Redbird for many reasons including the many challenges left from the mining operations and utilization of former haul road and rail line foundations. The road system depicted in Figure 9 remained constant throughout the planning process and is utilized in every entrance option presented in the "Gated Entrance" section. This system will utilize future reclamation project roads, entries, parking areas, and borrow areas (areas from which soil will be removed to build retaining walls, cover exposed coal waste, or be integrated into other reclamation features). Using former haul roads, rail beds, and future project infrastructure will substantially decrease the cost of property development. Additionally, the spine road is adjacent to areas where future amenities will be located. For example, Trail 0 (the proposed main park road) is a former haul road that connects to developed trailheads (include parking, shelters, and restrooms) and to potential interpretive areas such as Big Bertha, the largest reclaimed gob pile on site.

The proposed road system is also designed with emergency access and changes to customer needs in mind. For example, the road connects to both CR 350 and Center Road, allowing entrance locations to change or additional gates to be placed. Both access points can be used for emergency vehicles, multiple event entrances, or can be closed to restrict traffic flow. If necessary, entrances can be designated for non-motorized visitors and motorized visitors if it becomes apparent that the recreational uses are not compatible or motorized use increases to such a level that personal safety for non-motorized visitors becomes an issue.

3.H Gated Entrance

The main spine road system allows for two basic options for entrance gate locations. One option would be a southern entrance off CR 350; the other a western entrance off Center Road. Although it appears a western entrance would require less ground work, there has been more public resistance to this idea and there is a possibility that land subsidence due to old underground mining may be occurring in the area. A north entrance location was considered, but deemed not feasible due to the many changes that will occur during the next reclamation project. This project includes removal of the former haul road, possible realignment of Mud Creek to its original path, and restoration of the natural wetlands between Mud Creek and the northern property boundary.

Three preliminary plans were developed to compare various gate locations along CR 350. These proposed improvements in the south entrance options lie within Greene County. A fourth option was designed for a western entrance in Sullivan County. Each location presents its own challenges and addresses a different barrier. The active railroad that bisects the property is one of the main barriers. There is not a legal railroad crossing within the property boundaries; therefore, unlicensed and underage drivers must exit the property onto CR 350 to travel between the southeast trail system and the central and west systems which contain the most trails. Although the DNR is currently pursuing permission to build a railroad crossing for the trail system, the process is long, detailed, and expensive. The following designs include a trail railroad crossing but do not rely on its construction for implementation of the plan.

Redbird lies in both Sullivan and Greene counties which are serviced by different utility companies. Greene County utility lines do not extend west along CR 350 past CR 1550, and Sullivan County utilities end approximately 1,000 feet west of the county line. There is approximately 3,700 feet along CR 350/CR50 where utility lines may need to be installed. The rail line is within this 3,700 feet, taking utility lines across the railroad tracks can be a major bureaucratic project. There is potential of working with both counties to run utilities from Sullivan County into Greene County to supply any needs west of the railroad tracks.

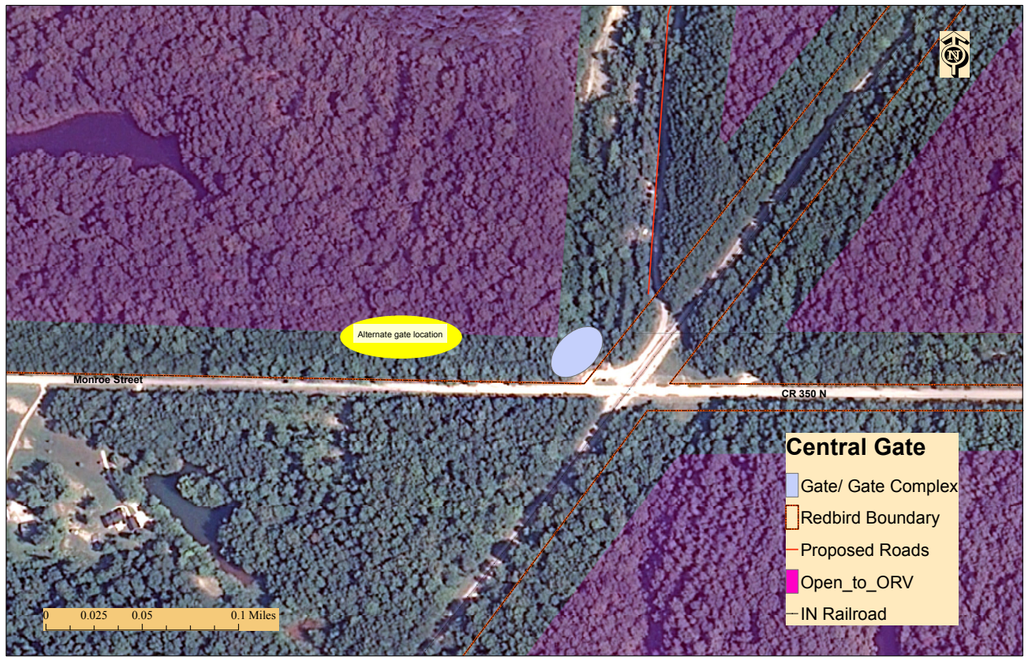


Figure 3.2: Central Gate Close View

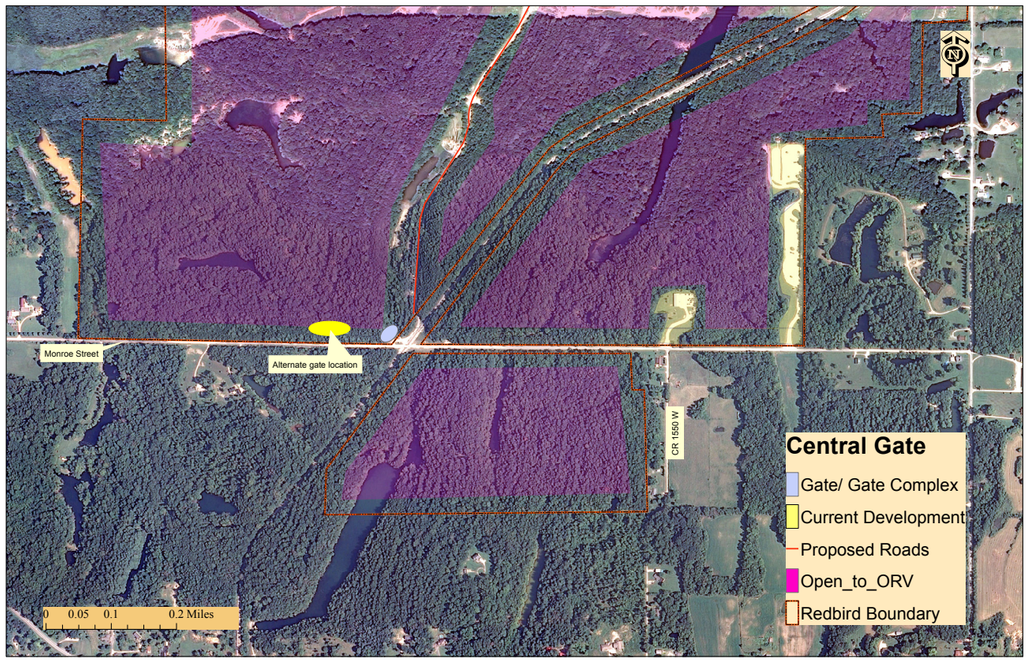


Figure 3.3: Central Gate Location

3.I South Entrance Options

Option 1: Central Gate Entrance (Figures 3.2 & 3.3)

This option moves the gated entrance west of the railroad tracks to the current intersection of Trail 0 and CR 350. The purpose of this location is for the majority of visitors to enter the property west of the railroad tracks. This will negate unlicensed or underage ORV drivers parking in the current lot and exiting the property onto a county road to get to the largest section of the trail system. It also provides non-motorized visitors direct access to the area of the property that is primarily designated for passive recreation.

There are multiple challenges with this location. The building would need to be a minimum of 75 feet from the railroad tracks which would place it in the spoils; therefore, large amounts of dirt work would need to be completed to accommodate a building and vehicle turnaround. A turnaround is necessary for those who prefer to park in the current parking area. The current parking area would need to have an electronic gate with individual access code for those vehicles. The access code would need to be generated at the time of payment and be good for the duration of the visitors stay. The utility provider would have to be established and the cost of running the utility lines would be high. If utilities were provided by Sullivan County there may be an additional compensatory fee from Greene County.

This option assumes building a typical gatehouse with minimal storage, and remodeling the existing maintenance building to provide additional office, conference, and storage space. It would not require vacation of CR 350.

An alternative placement of the gatehouse would be parallel to CR 350. This may require traffic to be directed into the property through Dugger (Sullivan Co.), but would alleviate problems of traffic backing up onto the road and over the railroad tracks. It would also align traffic with the road for ease of traveling to the current parking area or turning around to exit the property.

Option 2: South Gate Entrance (Figures 3.4 & 3.5)

This option requires vacating CR 350 west of CR 1550 to the Greene County border, places the gate building east of the railroad tracks, closer to the maintenance area and existing utilities, and allows building a gate/office/conference complex. There are both advantages and disadvantages to this location. The advantages include: (1) Close proximity to the maintenance area which reduces staff travel and fuel expenses; (2) Ability to provide an up-to-date conference area that can be used by DNR staff, constituent groups, and other organizations; (3) Use of current county road as main park entrance thereby alleviating the need to construct new foundations for a portion of the entrance complex; (4) Easy routes to State Route 54 via CR 1550 or CR 1500 should someone not want to enter the property; (5) The railroad crossing becomes a private crossing and can be used by all park visitors; (6) All utilities provided by one county; (7) Helps prevent unauthorized trail access off CR 350 due to high visibility from the gatehouse; (8) Access to the property south of CR 350 occurs within property boundaries; and (9) Additional staff (and security) near the most highly used areas of Redbird. There are also several disadvantages of a south gate location, which include: (1) Vacation of CR 350 from CR 1550 west to the Greene County boundary; (2) Creates a dead-end road in Sullivan County; (3) Requires significant dirt work that may include some spoils; (4) Will affect some established trails; (5) Requires installation of an electronic gate at the current parking area; and (6) May be more expensive than other options.

This option assumes additional management and clerical staff will be hired, property visitation will increase to provide additional revenue to support building utility and maintenance costs, programming and partnerships will be implemented to warrant use of a conference room, and converting the current parking area to a primitive or Class B campground is feasible.

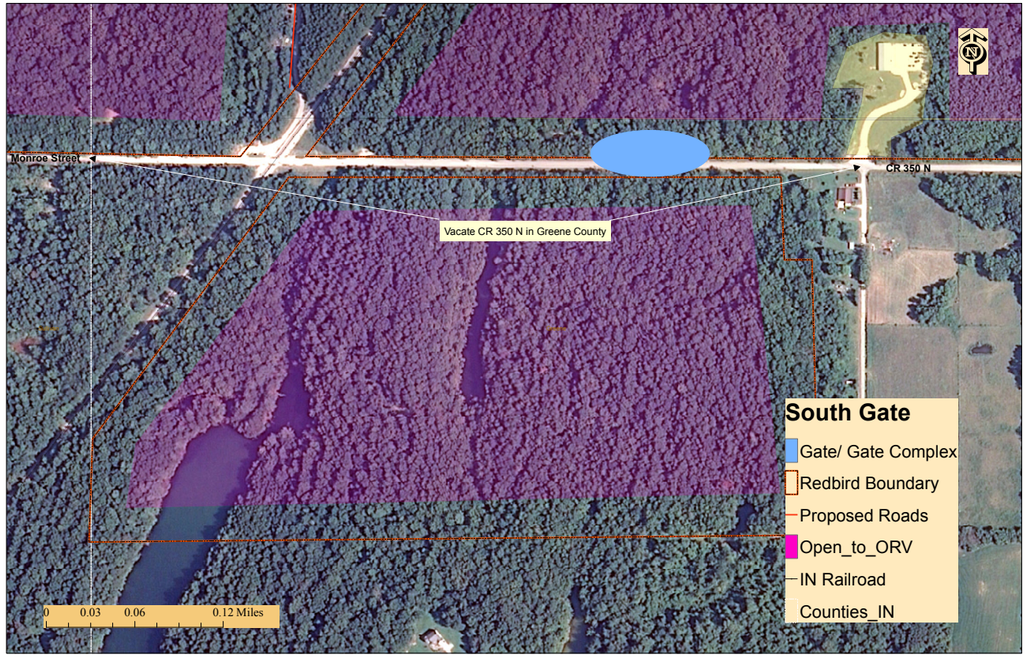


Figure 3.4: South Gate Close View

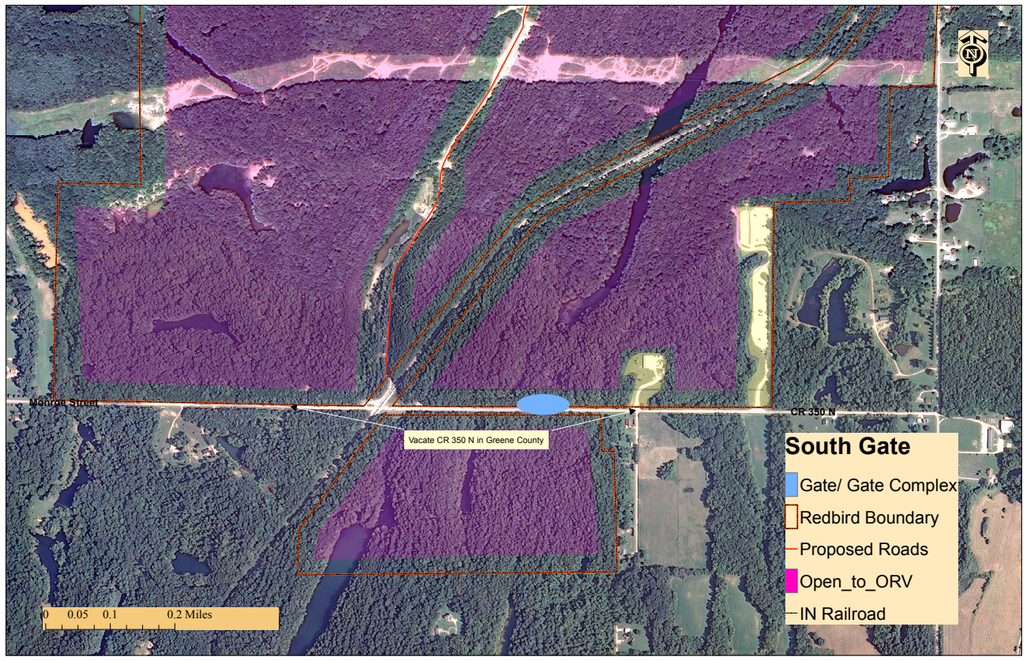


Figure 3.5: South Gate Location

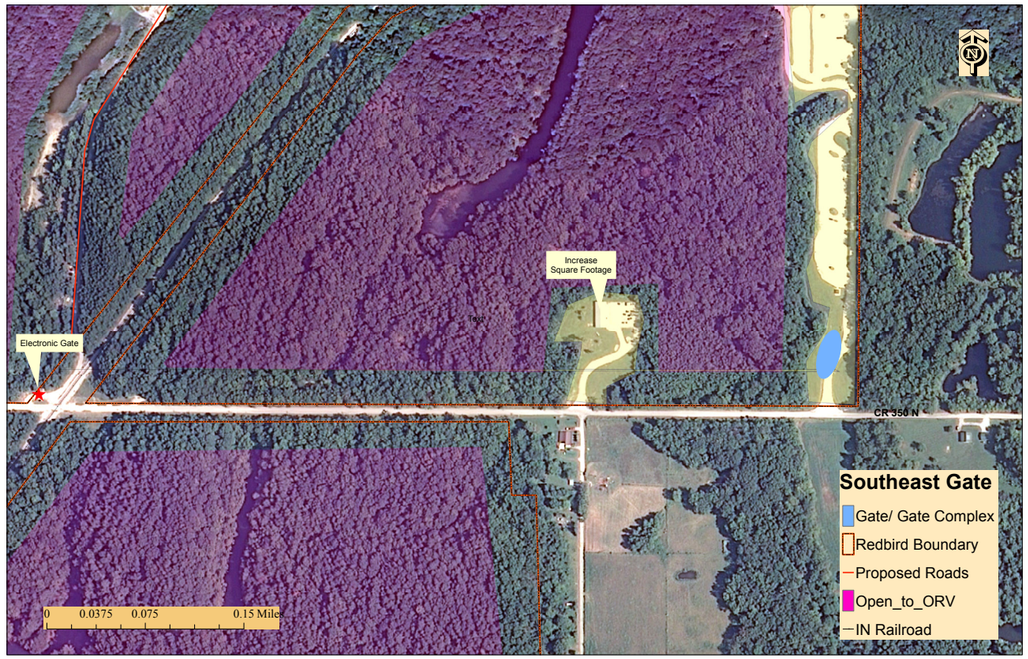


Figure 3.6: Southeast Gate Close View

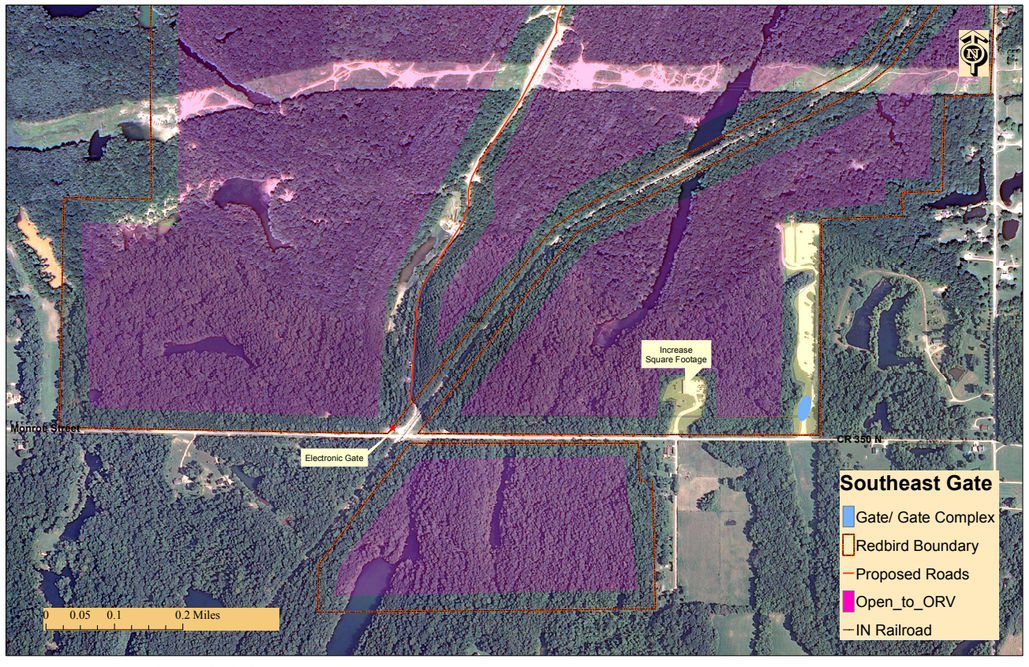


Figure 3.7: Southeast Gate Location

Option 3: Southeast Gate Entrance (Figures 3.6 & 3.7)

This option remodels the current facilities and requires the least amount of change. A southeast gate entrance leaves the gate at its current location. It enlarges the gatehouse to approximately 600 square feet to accommodate a desk, counter space, restroom/wash area, and storage area. The maintenance area would be remodeled to accommodate additional offices and conference area and an electronic gate would be installed at the intersection of current Trail 0 (future main park road) and CR 350.

This plan assumes CR 350 will not be vacated, a trail railroad crossing will be established, the current parking area will not be converted to a campground, additional staff will not be required, and fencing will be placed along CR 350 to deter unauthorized trail access. This is perhaps the least expensive option and only requires additional utility lines to the electronic gate (unless solar power is an option).

3.J West Entrance Option

Option 4: West Gate Entrance (Figures 3.8 & 3.9)

This option is a complete change and in many ways a restructure of the current concept. The west gate moves the entrance from Greene County to Sullivan County, increases the distance from State Route 54, utilizes acres that have never been surface mined for the entrance complex, and diverts non-motorized traffic away from the motorized recreation areas of the property. With this design, traffic enters the property off Center Road. The main park road basically divides the motorized areas from the non-motorized and provides a natural traffic flow of passive recreation visitors to the north and ORV visitors to the south. This does not prevent visitors from traveling either direction, but encourages less interaction which may result in a more effective overall operation.

This option utilizes the planned infrastructure development that will be necessary for the future reclamation project. The reclamation project will re-establish the former Center Road within the property boundaries, improve Trail 0 north of the power line, add equipment and vehicle parking in strategic locations, and provide lanes into work areas that can later become (in part) easy/beginner trails. This option does not require vacation of CR 350 and requires an electronic gate at the current parking area entrance.

Some of the disadvantages of a west entrance include utilities provided by multiple vendors, least preferred option by the public and county officials, and separation of the office from the maintenance complex.
This option assumes the current parking area will be used as a campground in the future, and the property visitation will grow to warrant additional staff, conference facilities, and increased customer service (such as a gift shop, programming and training facilities).

Figure 3.8: West Gate Close View

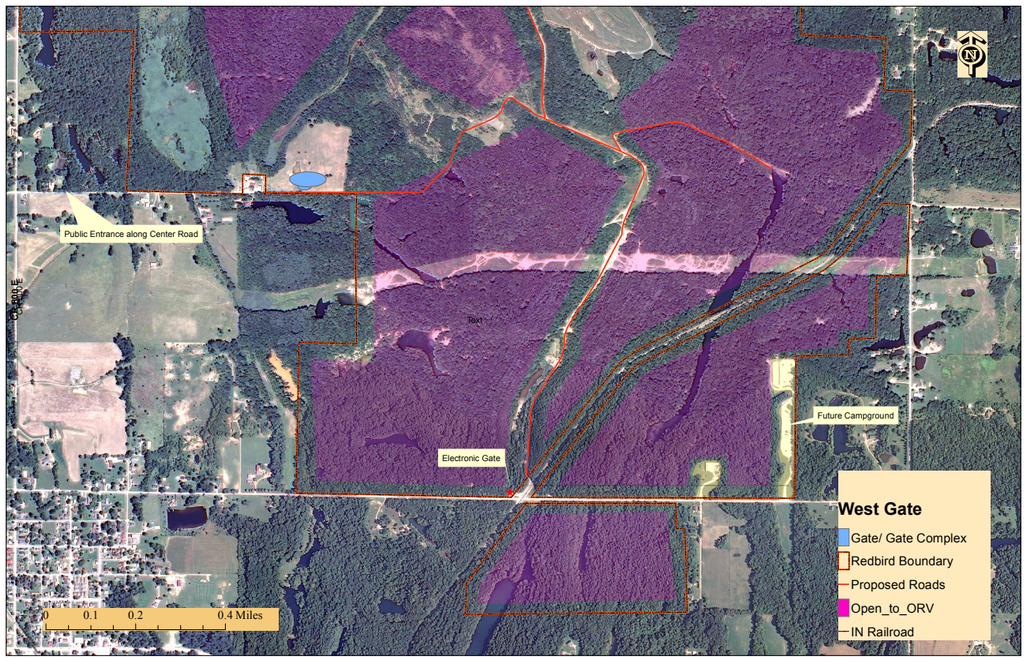


Figure 3.9: West Gate Location

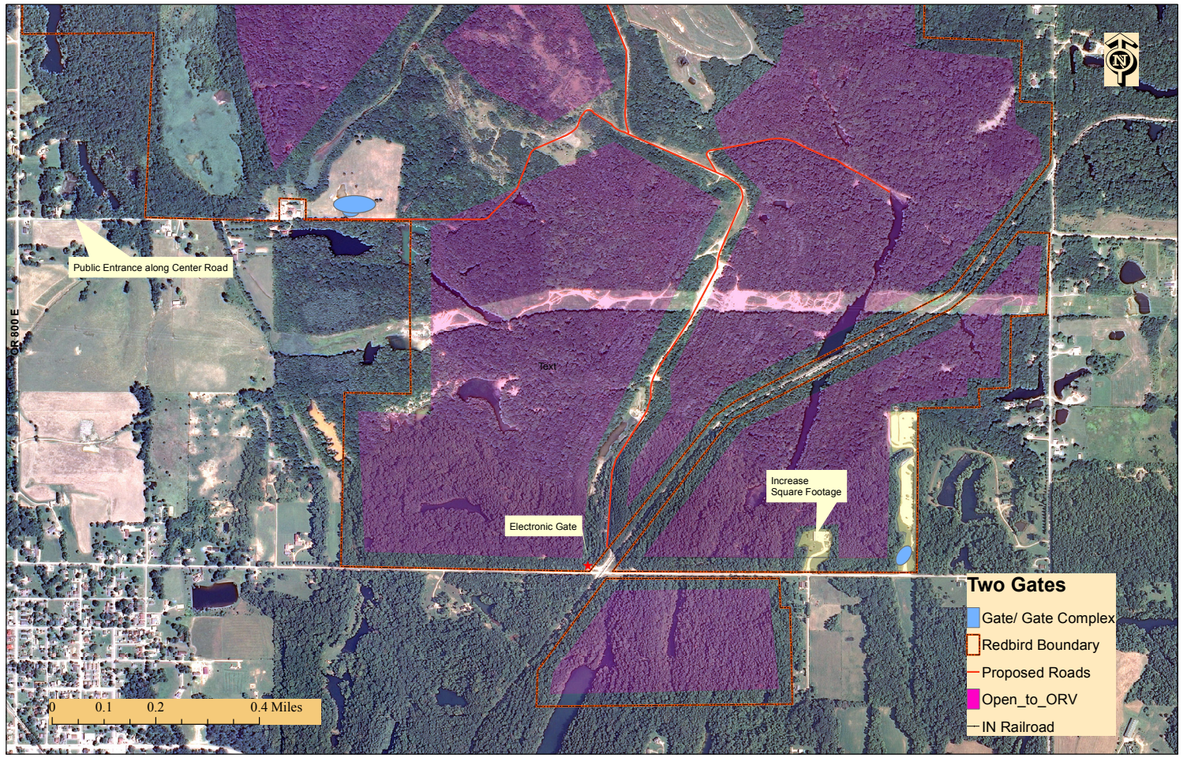


Figure 3.10: Two Gate Entrances

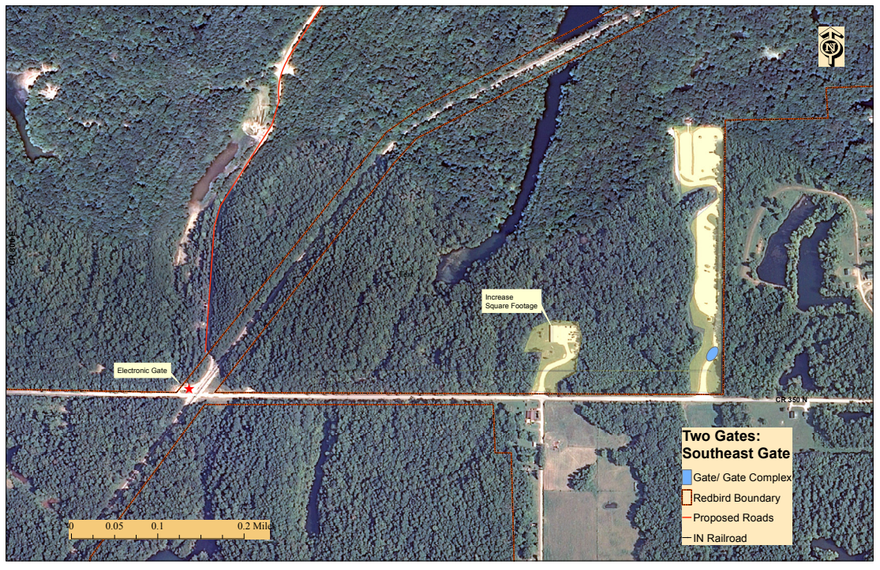


Figure 3.11: Two Gates: Southeast Gate Close View

Figure 3.12: Two Gates: West Gate Close View

3.K Alternative Concept

Two Gate Entrances (Figures 3.10, 3.11 & 3.12)

The plan concepts that have been presented are based on one gated entrance to Redbird SRA. An alternative concept that includes future construction of a second gate has been proposed for consideration. The basis for this alternative is the difficulties faced when considering construction, development (e.g., the railroad crossing and negative response by Sullivan County Commissioners and citizens), safety, and funding. This concept is a blending of the southeast and west gate entrances.

This option would increase the size of the current gatehouse to include a small office, additional desk, counter space, gift sales area, restroom/ wash area, and two storage areas (office supplies and cleaning supplies). The remodel would convert the gatehouse into a small gatehouse/office complex with internet access where normal clerical duties could be completed (e.g., ORV registration, record keeping, time reporting). The current maintenance building would be remodeled by extending the building to the south to enlarge office space and provide for a conference room to accommodate up to 30-50 people. An additional restroom within the new section would also be recommended.

Property development would continue to focus on customer amenities with trailheads, shelters, potable water, and improved trails being priority items. As non-motorized recreation increases and citizen opinions change a second gate would be constructed on the western boundary. The preferred location would be off Center Road after reclamation work is completed. The area should be tested for potential subsidence problems before any construction begins.

Sample West Gate Entrance Designs

(Courtesy Eric Schilldmeier, Purdue University Landscape Architect Capstone Project)

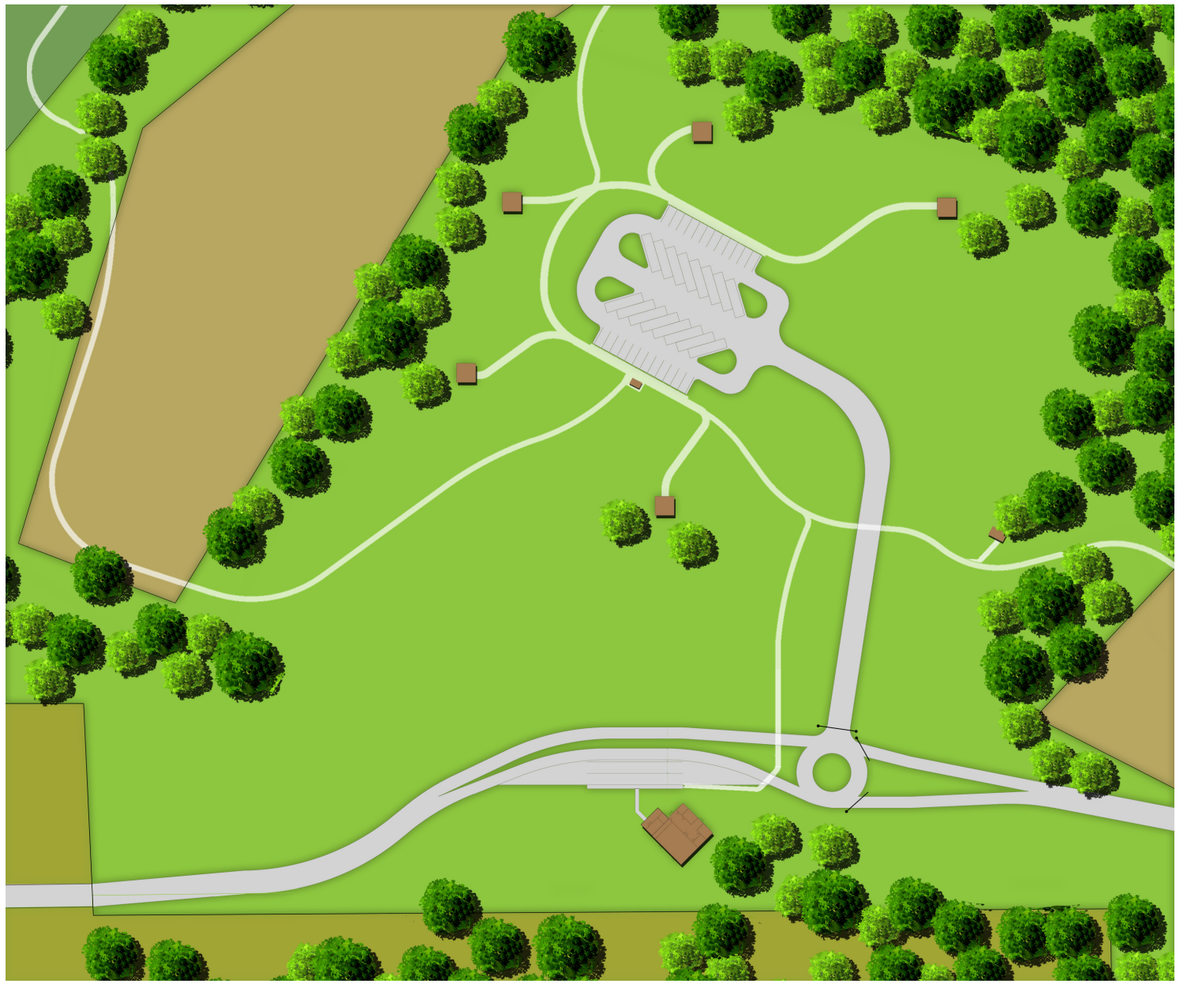


Figure 3.13: Independent Gatehouse

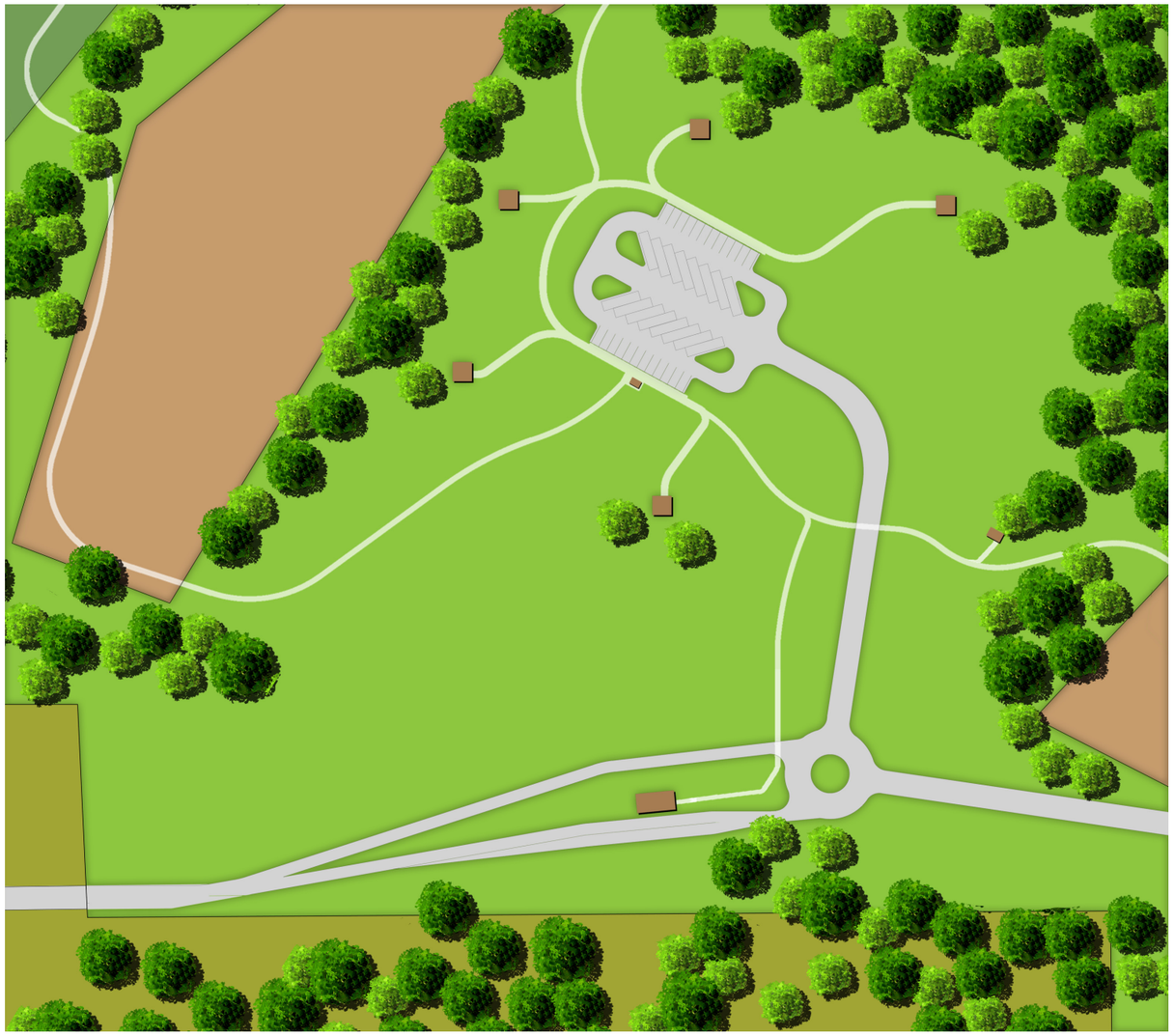


Figure 3.14: Integrated Gatehouse

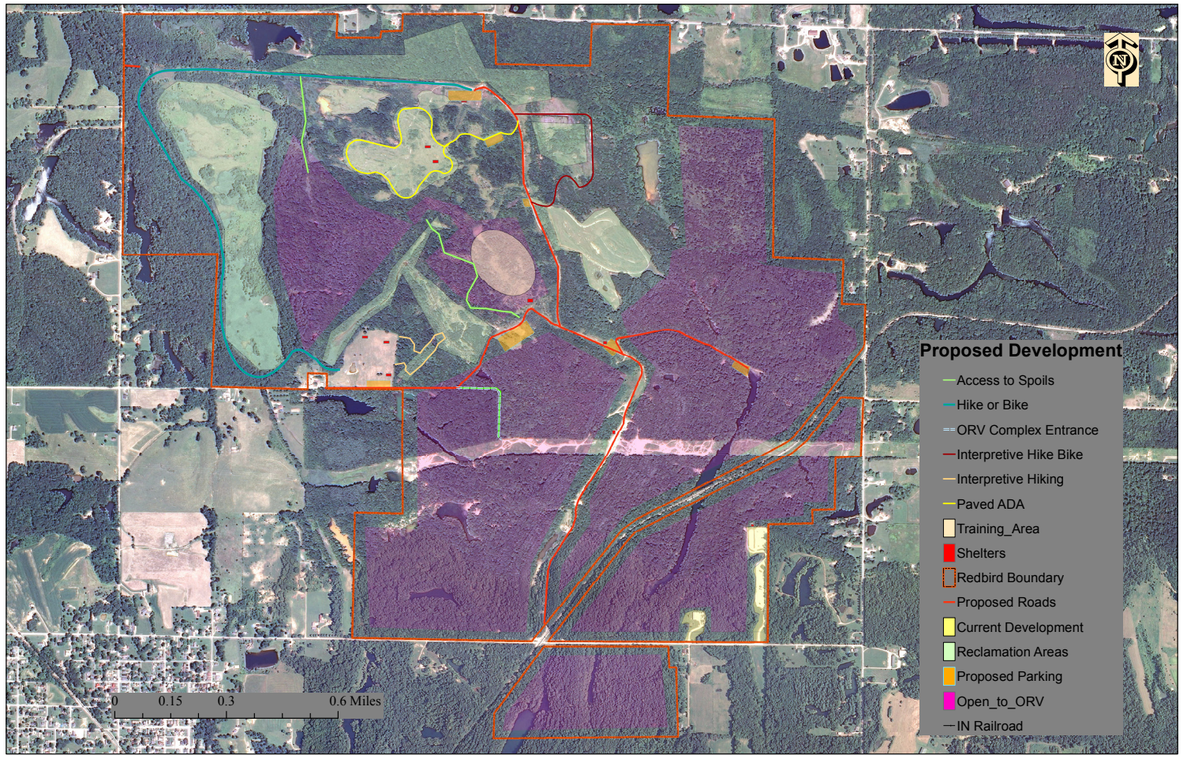


Figure 3.15: Proposed Development

3.L Redbird Development - Additional Amenities

For the purposes of this plan ORV trails and trails systems are not considered additional amenities and will not be discussed. Proposed additional amenity locations are depicted in Figures 3.15, 3.16, 3.17 and 3.18.

Parking

Parking areas west of the railroad tracks are recommended in several locations. This is due in part to the lack of large open spaces that could be easily constructed as parking. Gravel parking lots should be sufficient at Redbird in most locations; although, a paved lot near the proposed ADA trail should be considered. In addition to the parking areas indicated on the plan maps, parallel parking along the main park road (current Trail 0) is an option that may need to be implemented as visitation grows and separation of diverse groups (motorized and non-motorized) naturally occurs.

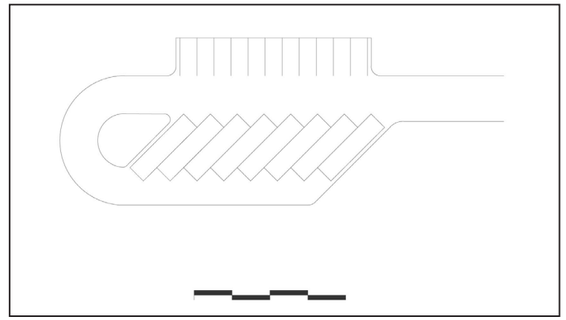


Figure 3.19: Small Parking Lot (Courtesy Eric Schildmeier, Purdue University Landscape Architect Capstone Project)

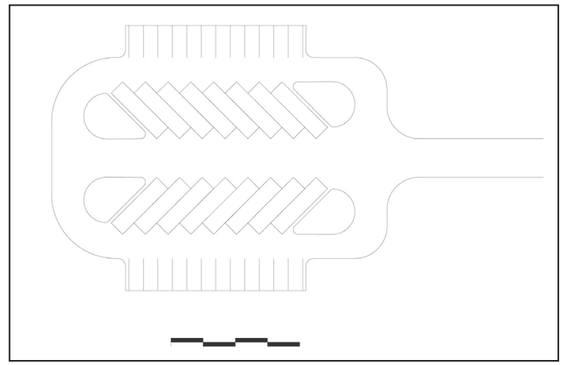


Figure 3.20: Large Parking Lot (Courtesy Eric Schildmeier, Purdue University Landscape Architect Capstone Project)

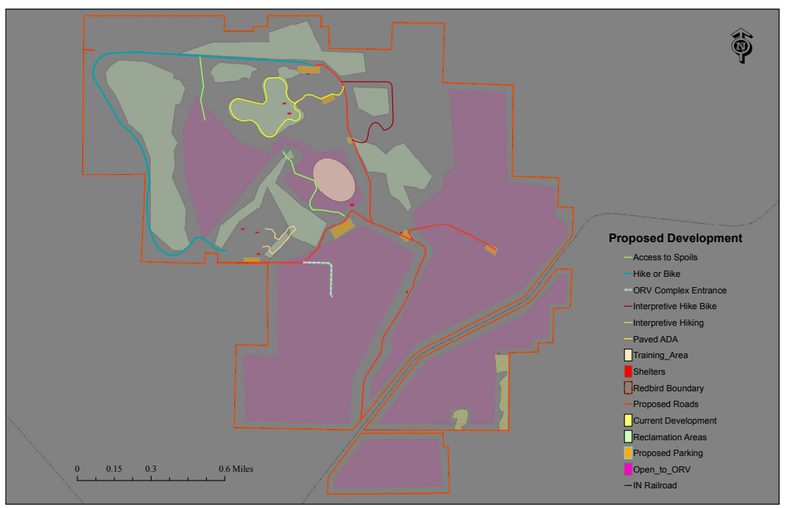


Figure 3.16: Proposed Development 2

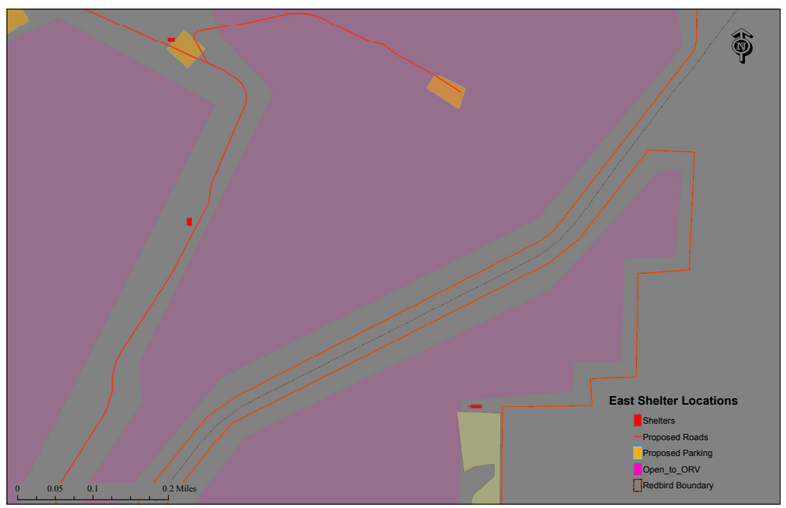


Figure 3.17: East Shelters Close View

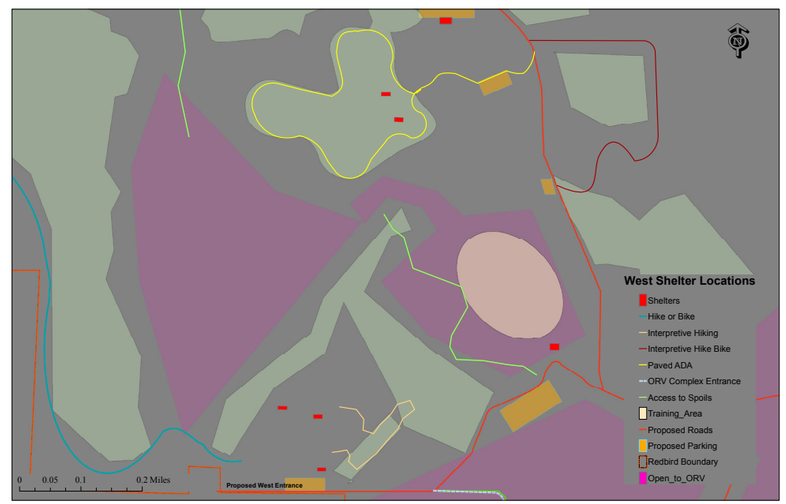


Figure 3.18: West Shelters Close View

Shelters

One of the main amenities recommended for Redbird is more shelters. Strategically placed shelters will encourage group gatherings and special events. A minimum of eight additional shelters is recommended (see plan maps). Shelters should be placed near parking areas, trailheads, and the proposed training facility. Clusters of shelters are recommended near the northern reclaimed lands and western acres that have not been surface mined, as these locations are buffered from ORV noise, provide natural vistas, are in close proximity to interpretive areas and trails, and have open space available for activities and play.

Including at least one improved shelter should be considered. This shelter should be equipped with electricity and a small kitchenette with buffet-style serving area. Potable water should be located at or near the shelter; a nearby mid-sized playground is also suggested. The preferred location would be the open grassy area near Center Road.

Potable Water

As Redbird grows and visitation increases it is likely the expectation of basic amenities will increase. Potable water is one of the most basic elements of any public facility. The cost of providing water to Redbird's interior may be high but the return on investment in customer satisfaction and repeat visitation could far outweigh the initial expense. To successfully promote the property to groups such as schools, wedding parties, 4-H, and/or corporate entities consideration of public health and safety needs to be addressed. Modern restrooms, drinking fountains, and wash facilities are no longer the exception in locations so close to developed areas. Although there are areas that may prohibit running water lines, due to the presence of coal waste, installing potable water near each shelter area or to as many areas as feasibly possible is suggested.

Restrooms

There are three vault toilets on site at this time. Two are located near the parking area and one is situated at a new trailhead near the center of the property. These locations are not inviting for large group gatherings nor are they near open space. A minimum of two additional restroom facilities should be installed in the future, one at the western picnic area and one at the training facility. Building modern restrooms at these locations would be preferred if it is feasible (based on the soils and building materials available). A third restroom is recommended at the northern picnic area, near the ADA trail. This restroom most likely needs to be a vault toilet and may require a specialized vault material such as heavy-duty polyurethane due to the nearby proximately of coal waste and its by-products.

ORV Trails

The purpose of Redbird has been to provide a recreational area for ORV enthusiasts; therefore, other types of trails have not been built. ORV trails are typically built by volunteers and organizations working with DNR staff. The volunteers design the trail, receive approval from designated DNR staff, and then build the trail. Once the trail is established and opened to the public, trail maintenance is a combined effort of the DNR and volunteer organization. This process is expected to continue, therefore, this plan does not address additional ORV trails. The recommendation of this plan is to increase the acres available for ORV trail development. The recommendation is to approve approximately 150 additional acres for ORV use. The total acreage is shown in each of the plan maps.

Non-motorized Trails

The purpose of this plan is not to design trails; however, there are four trails that fit within the scope of providing additional recreation and interpretation that will be mentioned. The first is a paved ADA trail near the northern picnic area. This trail is proposed because the land is part of a reclamation project that is relatively flat and needs to be protected. It would not be difficult to install a trail that meets all ADA slope and width requirements and the pavement would continue to cap the coal refuse preventing any erosion or pollution.

Two interpretive trails are recommended. One is a short easy to moderate hike–bike loop trail that starts at the north picnic area, skirts Big Bertha, passes through the remnants of a coal load out-station from the underground mining era, and travels beside an area of ongoing reclamation.

Figure 3.21: Trail Kiosk (Design courtesy of Eric Schildmeier, Purdue University Landscape Architect Capstone Project)

The second is a short walking-hiking loop trail that begins at the western picnic area and loops around a section of the future reclamation. The highlight of this trail will be the biological filtration system (passive treatment wetlands) that mitigates the negative effects of an acidic seep from the central spoil pile. Both of these trails are suggested because of the educational value, and signage could potentially be funded through the Indiana Geological Society.

The fourth trail that is recommended is a long easy hike–bike loop that utilizes a levee built during the original reclamation project and the roads that will be built for the future project. The non-road portion of this trail will traverse through the northern future reclamation project, loop south along the western slurry, and then meander east to the western picnic area. To complete the loop visitors would follow the road system back to the northern picnic area. The location and length of this trail makes it ideal for nature and bird watching, distance training, connections to more difficult nature trails, and sheltered interpretive rest stops.

Additional trails should be built at Redbird. The trails included in this plan can be incorporated into future reclamation and development projects. They are intended to enhance the visitor experience by extending and complementing the picnic areas.

Figure 3.22: Observation Shelter (Design courtesy of Eric Schildmeier, Purdue University Landscape Architect Capstone Project)

Training Center

The addition of an ORV training center is a long-time goal of the ORV constituent groups. A beginner trail was created; unfortunately, the trail location was on original reclamation work that had little soil cover, and misuse by adults caused erosion and acidic runoff problems. The trail was shut down with intentions to find alternative solutions. This plan presents an alternative.

The training center location (see Figure 3.15: Redbird Development) is in the central area of Redbird, just east of the original trail. This places the center off of the spoil pile in an area of scrub tree growth between spoil hills. Part of this area may be used to access future reclamation areas; if so, the footprint for either a small arena or beginning trails may be established.

The design of the training center should include a small to medium-sized arena (actual training area) with a dirt floor that can be used to set up ORV courses. The arena should not be less than 10,000 square feet (100-by-100 feet) to comply with the Motorcycle Safety Institute standards. It must be large enough to accommodate a training course, safety buffers and equipment, and a staging area. There should be viewing areas adjacent to the arena and enough space to accommodate multiple students. Ideally, the training arena would be large enough for special events and competitions.

The training center should also include beginner trails that are easily monitored by experienced riders and trainers. Some of the trails should be a higher level difficulty or connect to trails with training obstacles. For example, a beginner dirt bike trail may be flat with several technical elements and connect to a trail with small logs on it to teach students the proper approach and crossing techniques. These trails do not have to be long, but need to be built to be very sustainable. They also need to be easily accessible by first aiders and emergency responders.

The training center should have a modern restroom with storage for first-aid equipment. A shelter is proposed in the area to promote a family-friendly atmosphere and provide additional resources for spectators. Although the primary purpose of the training center is ORV classes, this should not be its only function. The center design should take into consideration possible uses by other groups, such as scout rope courses, mountain or stunt bike competitions, nature-based educational classes, and Native American pow wows.

Campground

Although an on-site campground was not identified as a high priority in the public meetings, it is a revenue generating amenity for the DNR. The addition of a non-traditional campground at Redbird could be accomplished with minimal investment depending on the final location of the gated entrance. The concept would be to convert the existing parking area into a Class B (electric sites with water nearby) campground. The campground's main purpose would be to provide for campers who are interested in motorized recreation; however, it would not be restricted to those visitors. This campground would be non-traditional in that it would not necessarily fit the DNR concept of a grassy shaded camp site, but would be modeled after some privately owned RV campgrounds which have a gravel base and minimal vegetation between sites. It would also provide larger sites to accommodate trucks or RVs towing trailers.

Due to the physical limitations of the area, the campground could support approximately 50-75 sites. While this is not an optimum number for revenue, it does provide additional customer service and support amenities for events, as well as for visitors who are traveling from distant locations. The addition of an on-site campground would increase property use and long-term visitation. The closest open campgrounds are at Shakamak State Park and Greene-Sullivan State Forest, which do not allow off-road vehicle use. A new primitive campground is being built at CR 350 N and CR 1550 W that will accommodate approximately 30 campers. It is currently open on a limited basis for group use. The size of both campgrounds should minimize competition between the public and privately owned facilities. Additionally, the DNR can work with the campground owner to provide special arrangements that benefit his clientele. For example, registration and motorized trail permit sales available at the private campground, handing out informational brochures about food and repair services, and recommendations to visitors when the Redbird campground is full.

3.M Preferred Plan Concepts

As stated previously, plan concepts differ only in the location of the gated entrance to Redbird SRA. The preliminary plans were presented to Outdoor Recreation staff and the following two preferred concepts were established. It is important to note that establishing a trail railroad crossing has not met with much success to date and it may be likely that vacation of CR 350 would lead to the removal of the current road railroad crossing defeating the main purpose of the vacation.

Preferred Concept 1 - Two Gate Entrances (Figures 3.23 & 3.24)

The establishment of two gates is appealing for several reasons. It provides steady improvements that are beneficial to staff efficiency, such as consolidating reporting processes and revenue collection in one location. It promotes building or remodeling facilities to meet customer and staff needs at a rate that keeps pace with funding availability, citizen perception, and changing trends in property use. It allows time for changes in the political structure that may result in a more positive reception of an entrance in Sullivan County. Finally, it blends the most popular concepts as stated in the public meetings and meetings with DNR staff.

The two gate entrances concept includes the following priority items in order of preferred implementation:

- Enlarge current gatehouse to include a small office with computer and internet service, to allow ORV registration and revenue reporting to be completed in the same location as fee collection. Include reception area large enough to accommodate a small mercantile display.
- Continue to pursue a trail railroad crossing and implement as soon as possible.
- Enlarge current maintenance building to increase office space and add a conference room and restroom.
- Improve main trail between current parking lot and railroad crossing to be accessible and the desired travel route for all trail users.
- Continue hang-tag system for those parking west of the railroad tracks. Install electronic gate as soon as feasible.
- Improve all trailheads with shelters, restrooms, and parking.
- Install boundary fencing along CR 350.
- Develop and build training center after reclamation work is completed (estimated 2014).
- Complete site design for west gate entrance.
- Build west gate entrance.

Leaving the west gate entrance as the final phase provides the time necessary to determine if the non-motorized use of Redbird is significant enough to warrant the construction.

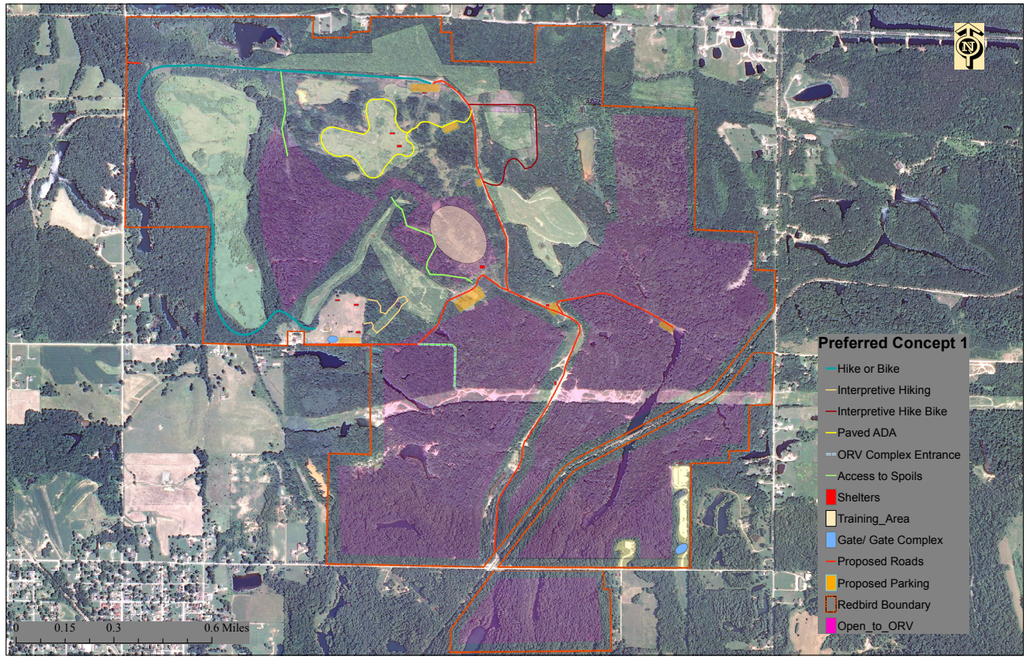


Figure 3.23: Preferred Concept 1

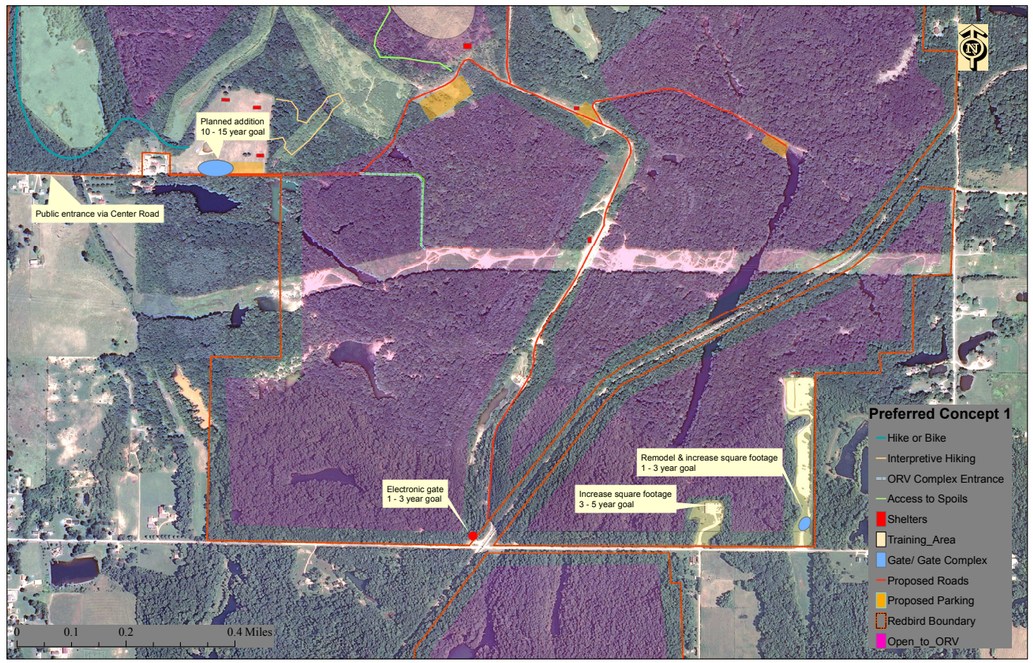


Figure 3.24: Preferred Concept 1, Gates Close View

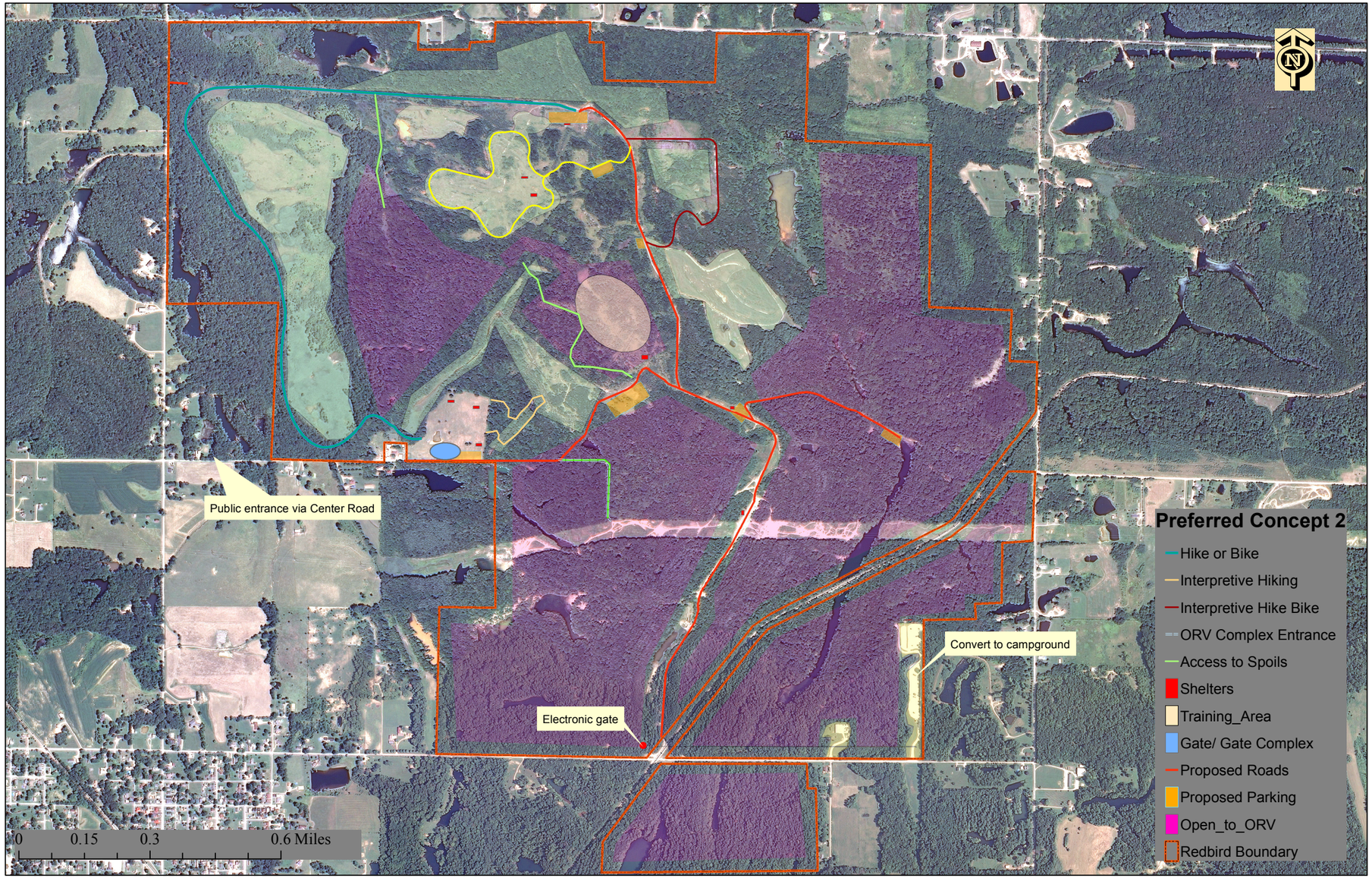


Figure 3.25: Preferred Concept 2

Preferred Concept 2 - West Gate Entrance (Figure 3.25)

Although this is the least-preferred concept by the public and county commissioners, it is the most realistic concept for: (1) Best utilization of infrastructure built or improved during the next reclamation project; (2) Avoiding railroad crossing by most traffic and non-licensed drivers; (3) Natural separation of non-motorized and motorized activities; (4) Ease of entrance by groups (e.g., school buses); and (5) Most realistic bike paths from Dugger to Redbird.

With this concept, priority focus would be shelters, parking, potable water, and trail development in the south and central areas of the property until the reclamation project is completed. Site design for the west entrance could be completed during the reclamation project. Permission to build a trail railroad crossing should still be pursued with a crossing being built as soon as possible. A training center could be built during the reclamation project; careful coordination between projects would be a must.

Adoption of the west gate entrance concept would delay facility remodeling and improvements until approximately 2014. This may affect organizations that currently hold meetings at Redbird due to the need to utilize all of the maintenance building for equipment storage. Currently the number of organizations meeting at the building is minimal; therefore, this may be a minor consideration.

3.N Conclusions

The largest project of the Redbird development plan could be the gate entrance. Whether the existing entrance is remodeled and used or a completely new concept, such as a west gate, is implemented, the cost will be high. Careful consideration to return on investment should be made and balanced by the community comments and preferences. The cost of much of the interior development can be deferred by using the future reclamation project to the property's advantage. Roads, parking, and perhaps trails can be the result of careful planning, communication, and working together. Amenities such as shelters and restrooms should be built with the future visitor population in mind. The amenities should cater to the modern property visitors because expectations typically increase as technology and access to conveniences increase. Most trails should result from cooperative efforts between volunteer and the DNR. The foundations for some trails are already in place and could be built by DNR staff with an eye toward interpretation and education. Finally, a training center should be developed to continue following the properties original goals and mission, but should be adaptable to uses other than ORV training.

A cost analysis with priority project tables follows.

3.O Cost Analysis

Overall Cost Analysis

Item	Qty	Unit	Unit Cost	Amount	Comments
Entrance					
Gatehouse conversion	300	SF	125	$ 37,500.00	Office, secure storage, counter w / sales area
Electric	295	LF	10	$ 2,950.00	
Water	300	LF	20	$ 6,000.00	Tentative
Sewer	N/A				Use vault toilet due to low ground & high water table
Maintenance building enlargement	500	SF	125	$ 62,500.00	Two offices, 1 conference room, public restrooms
Trail improvement to RR crossing	3,575	LF	20	$ 71,500.00	
RR crossing / improvements	1	EA	100,000	$ 100,000.00	Low cost alternative $30,000 (LED lights, solar power, etc.)
Road improvement – gravel					
Main road to AML improved road	5,725	LF	15	$ 5,875.00	Base in place
Parking to boat access	2,000	LF	30	$ 60,000.00	No base
AML improved road segment	4,700	LF	15	$ 70,500.00	
West entrance to AML improved road	4,000	LF	30	$ 120,000.00	
Electronic Gate	2	EA	3,300.00	$ 6,600.00	entrance side with keypad; exit side with sensor
Electric	2,500	LF	10	$ 25,000.00	Solar power option, if compatible $1,000
Interior parking – gravel					
	7	AC	110,000	$ 770,000.00	6 lots
	5	AC	110,000	$ 550,000.00	Road side; main interior road (Trail 0)
Shelters					
Regular	7	EA	30,000	$ 210,000.00	
Improved / kitchenette	1	EA	150,000	$ 150,000.00	
Restrooms – self contained, double vault / chase	3	EA	30,000	$ 90,000	
Modern restrooom	2	EA	85,000	$ 170,000.00	Concrete, factory plumbed & wired: Women's – 3 stalls & 2 sinks, Men's – 2 urinals, 1 stall, 2 sinks
Electric	1,000	LF	10	$ 10,000.00	Training facilitiy
Water	1,000	LF	20	$ 20,000.00	Training facilitiy
Septic	2	EA	35,000	$ 70,000.00	Training facility & near north picnic area

Figure 3.26:

Item	Qty	Unit	Unit Cost	Amount	Comments
Water to					
west picnic area	1,200	LF	20	$ 24,000.00	
training center – from west picnic	2,500	LF	20	$ 50,000.00	
Training Center					
Site Prep	2	AC	5,000	$ 10,000.00	
Perimeter fencing	500	LF	45	$ 22,500.00	Installed; Alternate: Safety barriers at strategic locations around arena, cost approx. $48.00 / LF
West Gate Entrance					
Gatehouse, office					
Building	2,000	SF	125	$ 250,000.00	
Electric	100	LF	10	$ 1,000.00	from main to building
Water	100	LF	20	$ 2,000.00	from main to building
Septic	1	LF	35,000	$ 35,000.00	
Road improved to paved, 3" – 4" overlay					
to gatehouse	1,100	LF	40	$ 44,000.00	
to parking & shelters	950	LF	40	$ 38,000.00	
Parking – paved	21,780	SF	5	$ 108,900.00	0.5 acre
Camping – non-traditional					Site 65' x 25' = 1625 SF; Use existing vault toilets & shelters
Campsites	75	EA	7,500	$ 562,500.00	Includes water & electric to site
Electric	4,500	LF	10	$ 45,000.00	
Water	3,500	LF	20	$ 70,000.00	
Cost Summary				**$ 3,951,325.00**	

Note: Chip & Seal may be more cost effective for roads and parking and is appropriate for this property
Cost savings may be available by using the building design for the Interlake gatehouse

Figure 3.27:

Phase 1: High Priority (0 - 5 years)

Item	Qty	Unit	Unit Cost	Amount	Comments
Entrance					
Gatehouse conversion	300	SF	125	$ 37,500.00	Office, secure storage, counter w / sales area
Utility upgrades					
Electric	295	LF	10	$ 2,950.00	
Water	300	LF	20	$ 6,000.00	Tentative
Sewer	N/A				Use vault toilet due to low ground & high water table
Maintenance building enlargement	500	SF	125	$ 62,500.00	Two offices, 1 conference room, public restrooms
Trail improvement to RR crossing	3,575	LF	20	$ 71,500.00	
RR crossing / improvements	100,000	EA	1	$ 100,000.00	
Cost Summary				**$ 280,450.00**	
Low cost alternate RR crossing	30,000	EA	1	$ 30,000.00	LED lights, solar power, etc.
Alternate Cost Summary				**$ 210,450.00**	

Figure 3.28:

Phase 2: Mid-Priority (3 – 7 years)

Item	Qty	Unit	Unit Cost	Amount	Comments
Road improvement – gravel					
Main road to AML improved road	5,725	LF	15	$ 85,875.00	Base in place
Parking to boat access	2,000	LF	30	$ 60,000.00	No base
AML improved road segment	4,700	LF	15	$ 70,500.00	If not paid via AML project funding
West entrance to AML improved road	4,000	LF	30	$ 120,000.00	If not paid via AML project funding
Electronic Gate	2	ea	3,300.00	$ 6,600.00	entrance side with keypad; exit side with sensor
Electric supply	2,500	LF	10	$ 25,000.00	Solar power option, if compatible $1,000
Interior parking – gravel					
	7	AC	110,000	$ 770,000.00	6 lots
	5	AC	110,000	$ 550,000.00	Road side; main interior road (Trail 0)
Shelters					
Regular	7	EA		$ 210,000.00	
Improved / kitchenette	1	EA		$ 150,000.00	
Restrooms – self contained, double vault w / chase	3	EA	30,000	$ 90,000.00	
Cost Summary				**$ 2,137,975.00**	
Low cost alternate – solar power to electronic gate	*2*	*EA*	*1,000*	*$ 2,000.00*	
Alternate Cost Summary				**$ 2,112,975.00**	
Cost Summary minus potential AML funds				*$ 1,947,475.00*	
Cost Summary minus potential AML funds & with solar power gate				*$ 1,924,475.00*	

Figure 3.29:

Phase 3: Mid-Priority 2 (5 - 10 years)

Item	Qty	Unit	Unit Cost	Amount	Comments
Modern restroom	2	EA	85,000	$ 170,000.00	Concrete, factory plumbed & wired: Women's – 3 stalls & 2 sinks, Men's – 2 urinals, 1 stall, 2 sinks
Electric	1,000	LF	10	$ 10,000.00	Training facilitiy
Water	1,000	LF	20	$ 20,000.00	Training facilitiy
Septic	2	EA	35,000	$ 70,000.00	Training facilitiy & near north picnic areas
Water to					
west picnic area	1,200	LF	20	$ 24,000.00	
training center – from west picnic	2,500	LF	20	$ 50,000.00	
Training Center					
Site Prep	2	AC	5,000	$ 10,000.00	
Perimeter fencing	500	LF	45	$ 22,500.00	Installed: Alternate: Safety barriers at strategic locations around arena, cost approx. $48.00 / LF
Cost Summary				**$ 376,500.00**	

Note: Septic to north picnic areas may be feasible due to soil conditions

Figure 3.30:

Phase 4: Low Priority (10 years)

Item	Qty	Unit	Unit Cost	Amount	Comments
West Gate Entrance					
Gatehouse, office					
Building	2,000	SF	125	$ 250,000.00	
Electric	100	LF	10	$ 1,000.00	from main to building
Water	100	LF	20	$ 2,000.00	from main to building
Septic	1	LF	35,000	$ 35,000.00	
Road improved to paved, 3" – 4" overlay					
to gatehouse	1,100	LF	40	$ 44,000.00	
to parking & shelters	950	LF	40	$ 38,000.00	
Parking – paved	21,780	SF	5	$ 108,900.00	0.5 acre
Camping, non-traditional					Site 65' x 25' = 1625 SF; Use existing vault toilets & shelters
Camp sites	75	EA	7,500	$ 562,500.00	Includes water & electric to site
Electric	4,500	LF	10	$ 45,000.00	
Water	3,500	LF	20	$ 70,000.00	
Cost Summary				**$ 1,156,400.00**	

Figure 3.31:



Appendix A: Custom Soil Survey Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Greene County, Indiana, and Sullivan County, Indiana

April 25, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

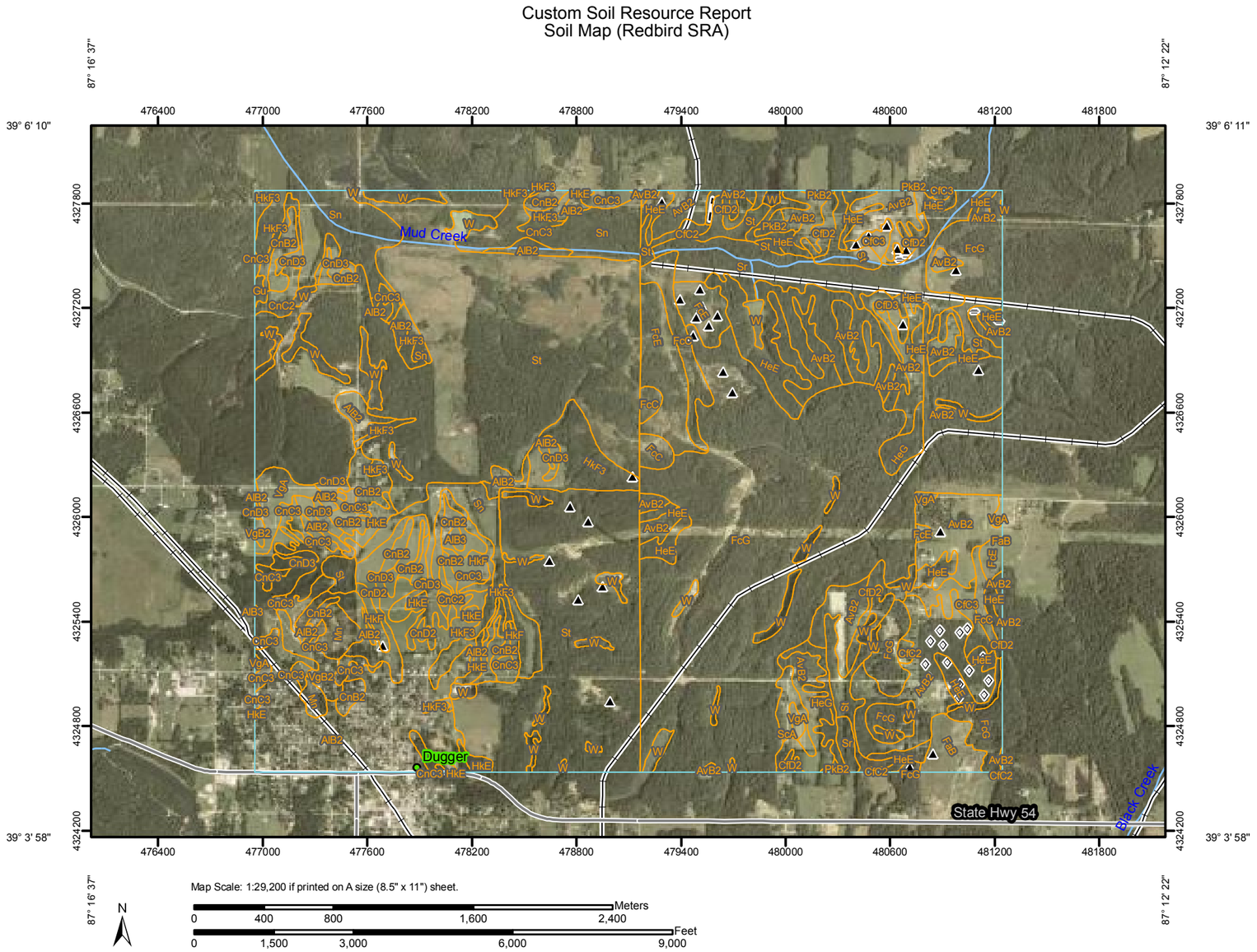
While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:29,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Greene County, Indiana
Survey Area Data: Version 11, Aug 10, 2009

Soil Survey Area: Sullivan County, Indiana
Survey Area Data: Version 13, Aug 11, 2009

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 7/30/2003; 7/14/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Redbird SRA)

Greene County, Indiana (IN055)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AvB2	Ava silt loam, 2 to 6 percent slopes, eroded	302.0	8.5%
CfC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	8.5	0.2%
CfC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	26.5	0.7%
CfD2	Cincinnati silt loam, 12 to 18 percent slopes, eroded	33.5	0.9%
CfD3	Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	9.6	0.3%
FaB	Fairpoint silt loam, reclaimed, 2 to 6 percent slopes	21.1	0.6%
FcC	Fairpoint parachannery clay loam, 2 to 12 percent slopes	47.9	1.4%
FcE	Fairpoint parachannery clay loam, 18 to 35 percent slopes	74.1	2.1%
FcG	Fairpoint very parachannery loam, 35 to 90 percent slopes	767.8	21.7%
HeE	Hickory silt loam, 18 to 25 percent slopes	173.4	4.9%
HeG	Hickory loam, 30 to 60 percent slopes	24.8	0.7%
PkB2	Pike silt loam, 2 to 6 percent slopes, eroded	5.6	0.2%
ScA	Shakamak silt loam, 1 to 3 percent slopes	11.7	0.3%
Sr	Steff silt loam, frequently flooded	99.4	2.8%
St	Stendal silt loam, frequently flooded	63.4	1.8%
VgA	Vigo silt loam, 0 to 2 percent slopes	6.3	0.2%
W	Water	40.6	1.1%
Subtotals for Soil Survey Area		**1,716.2**	**48.4%**
Totals for Area of Interest		**3,544.0**	**100.0%**

Sullivan County, Indiana (IN153)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AlB2	Ava silt loam, 2 to 6 percent slopes, eroded	253.0	7.1%
AlB3	Ava silt loam, 2 to 6 percent slopes, severely eroded	2.4	0.1%
CnB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded	74.8	2.1%
CnC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	12.9	0.4%
CnC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	49.4	1.4%
CnD2	Cincinnati silt loam, 12 to 18 percent slopes, eroded	39.5	1.1%
CnD3	Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	61.1	1.7%
Gu	Gullied land	2.3	0.1%

Sullivan County, Indiana (IN153)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
HkE	Hickory silt loam, 18 to 25 percent slopes	24.3	0.7%
HkF	Hickory silt loam, 25 to 35 percent slopes	13.8	0.4%
HkF3	Hickory silt loam, 18 to 35 percent slopes, severely eroded	84.2	2.4%
Mn	Mine dumps	18.5	0.5%
Sn	Stendal silt loam	172.9	4.9%
St	Strip mines	929.4	26.2%
VgA	Vigo silt loam, 0 to 2 percent slopes	19.3	0.5%
VgB2	Vigo silt loam, 2 to 4 percent slopes, eroded	15.8	0.4%
W	Water	54.1	1.5%
Subtotals for Soil Survey Area		**1,827.8**	**51.6%**
Totals for Area of Interest		**3,544.0**	**100.0%**

Map Unit Descriptions (Redbird SRA)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Greene County, Indiana

AvB2—Ava silt loam, 2 to 6 percent slopes, eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Ava and similar soils: 100 percent

Description of Ava

Setting
Landform: Till plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: 25 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.3 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 8 inches: Silt loam
8 to 27 inches: Silt loam
27 to 43 inches: Silt loam
43 to 59 inches: Silt loam
59 to 80 inches: Loam

CfC2—Cincinnati silt loam, 6 to 12 percent slopes, eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Cincinnati and similar soils: 100 percent

Description of Cincinnati

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 6 to 12 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.8 inches)

Interpretive groups
Land capability (nonirrigated): 3e

Typical profile
0 to 8 inches: Silt loam
8 to 25 inches: Silt loam
25 to 47 inches: Loam
47 to 80 inches: Clay loam

CfC3—Cincinnati silt loam, 6 to 12 percent slopes, severely eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Cincinnati, severely eroded, and similar soils: 100 percent

Description of Cincinnati, Severely Eroded

Setting
Landform: Till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear

Parent material: Loess over loamy till

Properties and qualities
Slope: 6 to 12 percent
Depth to restrictive feature: 10 to 20 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.5 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 8 inches: Silt loam
8 to 18 inches: Silty clay loam
18 to 46 inches: Loam
46 to 80 inches: Clay loam

CfD2—Cincinnati silt loam, 12 to 18 percent slopes, eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Cincinnati and similar soils: 100 percent

Description of Cincinnati

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 12 to 18 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.8 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 6 inches: Silt loam
6 to 24 inches: Silt loam
24 to 32 inches: Silt loam
32 to 80 inches: Clay loam

CfD3—Cincinnati silt loam, 12 to 18 percent slopes, severely eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Cincinnati, severely eroded, and similar soils: 100 percent

Description of Cincinnati, Severely Eroded

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 12 to 18 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups
Land capability (nonirrigated): 6e

Typical profile
0 to 6 inches: Silt loam
6 to 14 inches: Silty clay loam
14 to 29 inches: Loam
29 to 80 inches: Clay loam

FaB—Fairpoint silt loam, reclaimed, 2 to 6 percent slopes

Map Unit Setting
Elevation: 340 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Fairpoint and similar soils: 100 percent

Description of Fairpoint

Setting
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coal extraction mine spoil

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.0 inches)

Interpretive groups
Land capability (nonirrigated): 3e

Typical profile
0 to 2 inches: Silt loam
2 to 5 inches: Silt loam
5 to 27 inches: Silt loam
27 to 80 inches: Very parachannery silt loam

FcC—Fairpoint parachannery clay loam, 2 to 12 percent slopes

Map Unit Setting
Elevation: 340 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Fairpoint and similar soils: 100 percent

Description of Fairpoint

Setting
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coal extraction mine spoil

Properties and qualities
Slope: 2 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.1 inches)

Interpretive groups
Land capability (nonirrigated): 6e

Typical profile
0 to 4 inches: Parachannery clay loam
4 to 60 inches: Extremely parachannery clay loam

FcE—Fairpoint parachannery clay loam, 18 to 35 percent slopes

Map Unit Setting
Elevation: 340 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Fairpoint and similar soils: 100 percent

Description of Fairpoint

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coal extraction mine spoil

Properties and qualities
Slope: 18 to 35 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.1 inches)

Interpretive groups
Land capability (nonirrigated): 6e

Typical profile
0 to 4 inches: Parachannery clay loam
4 to 60 inches: Extremely parachannery clay loam

FcG—Fairpoint very parachannery loam, 35 to 90 percent slopes

Map Unit Setting
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Fairpoint and similar soils: 100 percent

Description of Fairpoint

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coal extraction mine spoil

Properties and qualities
Slope: 35 to 90 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 5 inches: Very parachannery loam
5 to 60 inches: Very parachannery loam

HeE—Hickory silt loam, 18 to 25 percent slopes

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Hickory and similar soils: 100 percent

Description of Hickory

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 18 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.6 inches)

Interpretive groups
Land capability (nonirrigated): 6e

Typical profile
0 to 2 inches: Silt loam
2 to 11 inches: Silt loam
11 to 56 inches: Clay loam
56 to 80 inches: Clay loam

HeG—Hickory loam, 30 to 60 percent slopes

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 170 to 200 days

Map Unit Composition
Hickory and similar soils: 100 percent

Description of Hickory

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till

Properties and qualities
Slope: 30 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water capacity: High (about 9.3 inches)

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 3 inches: Loam
3 to 7 inches: Loam
7 to 39 inches: Clay loam
39 to 45 inches: Loam
45 to 80 inches: Loam

PkB2—Pike silt loam, 2 to 6 percent slopes, eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Pike and similar soils: 100 percent

Description of Pike

Setting
Landform: Outwash plains
Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy outwash

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 11.0 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 9 inches: Silt loam
9 to 39 inches: Silty clay loam
39 to 53 inches: Silt loam
53 to 80 inches: Sandy loam

ScA—Shakamak silt loam, 1 to 3 percent slopes

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Shakamak and similar soils: 100 percent

Description of Shakamak

Setting
Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 1 to 3 percent
Depth to restrictive feature: 30 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches

Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 10 inches: Silt loam
10 to 28 inches: Silty clay loam
28 to 35 inches: Silty clay loam
35 to 57 inches: Silt loam
57 to 69 inches: Silt loam
69 to 80 inches: Clay loam

Sr—Steff silt loam, frequently flooded

Map Unit Setting
Elevation: 340 to 1,020 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Steff and similar soils: 100 percent

Description of Steff

Setting
Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Acid loamy alluvium

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: High (about 10.9 inches)

Interpretive groups
Land capability (nonirrigated): 2w

Typical profile
0 to 10 inches: Silt loam
10 to 31 inches: Silt loam

31 to 60 inches: Stratified silt loam to loam to sandy loam

St—Stendal silt loam, frequently flooded

Map Unit Setting
Elevation: 340 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 200 days

Map Unit Composition
Stendal, drained, and similar soils: 97 percent

Description of Stendal, Drained

Setting
Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Acid silty alluvium

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: Very high (about 12.8 inches)

Interpretive groups
Land capability (nonirrigated): 2w

Typical profile
0 to 11 inches: Silt loam
11 to 41 inches: Silt loam
41 to 60 inches: Stratified silt loam to silty clay loam to loam

VgA—Vigo silt loam, 0 to 2 percent slopes

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 170 to 200 days

Map Unit Composition
Vigo, drained, and similar soils: 97 percent

Description of Vigo, Drained

Setting
Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.3 inches)

Interpretive groups
Land capability (nonirrigated): 2w

Typical profile
0 to 8 inches: Silt loam
8 to 22 inches: Silt loam
22 to 46 inches: Silt loam
46 to 70 inches: Silt loam
70 to 80 inches: Loam

W—Water

Map Unit Composition
Water: 100 percent

Sullivan County, Indiana

AlB2—Ava silt loam, 2 to 6 percent slopes, eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Ava and similar soils: 100 percent

Description of Ava

Setting
Landform: Till plains
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 11 inches: Silt loam
11 to 22 inches: Silty clay loam
22 to 55 inches: Silty clay loam
55 to 80 inches: Clay loam

AlB3—Ava silt loam, 2 to 6 percent slopes, severely eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Ava, severely eroded, and similar soils: 100 percent

Description of Ava, Severely Eroded

Setting
Landform: Till plains
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: 15 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.2 inches)

Interpretive groups
Land capability (nonirrigated): 3e

Typical profile
0 to 6 inches: Silt loam
6 to 16 inches: Silty clay loam
16 to 49 inches: Silty clay loam
49 to 80 inches: Clay loam

CnB2—Cincinnati silt loam, 2 to 6 percent slopes, eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Cincinnati and similar soils: 100 percent

Description of Cincinnati

Setting
Landform: Till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear

Parent material: Loess over loamy till

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: 22 to 36 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 11 inches: Silt loam
11 to 29 inches: Silty clay loam
29 to 51 inches: Silty clay loam
51 to 80 inches: Clay loam

CnC2—Cincinnati silt loam, 6 to 12 percent slopes, eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Cincinnati and similar soils: 100 percent

Description of Cincinnati

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 6 to 12 percent
Depth to restrictive feature: 22 to 36 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups
Land capability (nonirrigated): 3e

Typical profile
0 to 11 inches: Silt loam
11 to 29 inches: Silty clay loam
29 to 51 inches: Silty clay loam
51 to 80 inches: Clay loam

CnC3—Cincinnati silt loam, 6 to 12 percent slopes, severely eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Cincinnati, severely eroded, and similar soils: 100 percent

Description of Cincinnati, Severely Eroded

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 6 to 12 percent
Depth to restrictive feature: 22 to 36 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.3 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 6 inches: Silt loam
6 to 23 inches: Silty clay loam
23 to 45 inches: Silty clay loam
45 to 80 inches: Clay loam

CnD2—Cincinnati silt loam, 12 to 18 percent slopes, eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Cincinnati and similar soils: 100 percent

Description of Cincinnati

Setting
Landform: Till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 12 to 18 percent
Depth to restrictive feature: 22 to 36 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 11 inches: Silt loam
11 to 29 inches: Silty clay loam
29 to 51 inches: Silty clay loam
51 to 80 inches: Clay loam

CnD3—Cincinnati silt loam, 12 to 18 percent slopes, severely eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 170 to 210 days

Map Unit Composition
Cincinnati, severely eroded, and similar soils: 100 percent

Description of Cincinnati, Severely Eroded

Setting
Landform: Till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 12 to 18 percent
Depth to restrictive feature: 22 to 36 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.3 inches)

Interpretive groups
Land capability (nonirrigated): 6e

Typical profile
0 to 6 inches: Silt loam
6 to 23 inches: Silty clay loam
23 to 45 inches: Silty clay loam
45 to 80 inches: Clay loam

Gu—Gullied land

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Gullied land, very severely eroded: 100 percent

Description of Gullied Land, Very Severely Eroded

Setting
Landform: Hills

Interpretive groups
Land capability (nonirrigated): 8e

HkE—Hickory silt loam, 18 to 25 percent slopes

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Hickory and similar soils: 100 percent

Description of Hickory

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 18 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water capacity: High (about 9.2 inches)

Interpretive groups
Land capability (nonirrigated): 6e

Typical profile
0 to 11 inches: Silt loam
11 to 50 inches: Clay loam
50 to 60 inches: Loam

HkF—Hickory silt loam, 25 to 35 percent slopes

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 170 to 210 days

Map Unit Composition
Hickory and similar soils: 100 percent

Description of Hickory

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 25 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water capacity: High (about 9.2 inches)

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 11 inches: Silt loam
11 to 50 inches: Clay loam
50 to 60 inches: Loam

HkF3—Hickory silt loam, 18 to 35 percent slopes, severely eroded

Map Unit Setting
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Hickory, severely eroded, and similar soils: 100 percent

Description of Hickory, Severely Eroded

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex

Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 18 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water capacity: Moderate (about 8.3 inches)

Interpretive groups
Land capability (nonirrigated): 6e

Typical profile
0 to 6 inches: Silt loam
6 to 42 inches: Clay loam
42 to 60 inches: Loam

Mn—Mine dumps

Map Unit Setting
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Dumps, mine: 90 percent

Description of Dumps, Mine

Setting
Parent material: Coal extraction mine spoil

Interpretive groups
Land capability (nonirrigated): 8

Sn—Stendal silt loam

Map Unit Setting
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Stendal and similar soils: 90 percent

Description of Stendal

Setting
Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Acid silty alluvium

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: Very high (about 12.2 inches)

Interpretive groups
Land capability (nonirrigated): 2w

Typical profile
0 to 10 inches: Silt loam
10 to 60 inches: Silt loam

St—Strip mines

Map Unit Setting
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Strip mines: 90 percent

Description of Strip Mines

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coal extraction mine spoil

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 4 inches: Shaly silt loam
4 to 60 inches: Very shaly silty clay loam

VgA—Vigo silt loam, 0 to 2 percent slopes

Map Unit Setting
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Vigo and similar soils: 90 percent

Description of Vigo

Setting
Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 12.0 inches)

Interpretive groups
Land capability (nonirrigated): 2w

Typical profile
0 to 9 inches: Silt loam
9 to 23 inches: Silt loam
23 to 60 inches: Silty clay loam
60 to 80 inches: Clay loam

VgB2—Vigo silt loam, 2 to 4 percent slopes, eroded

Map Unit Setting
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days

Map Unit Composition
Vigo and similar soils: 90 percent

Description of Vigo

Setting
Landform: Till plains
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Properties and qualities
Slope: 2 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 12.4 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 9 inches: Silt loam
9 to 23 inches: Silt loam
23 to 60 inches: Silty clay loam
60 to 80 inches: Clay loam

W—Water

Map Unit Composition
Water: 100 percent

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://soils.usda.gov/

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://soils.usda.gov/

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://soils.usda.gov/

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.glti.nrcs.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://soils.usda.gov/

Custom Soil Resource Report

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.



Appendix B

Public Meeting Comment Vote Results

Appendix B: Public Meeting Comment Vote Results

Comment	Total Votes
Acquire CR 350 in Greene County from CR 1550 west	54
Keep entrance near CR 350 & CR 1550	24
Have separate parking for motorized and non-motorized use	24
Install additional restrooms	21
Build entrance on west side of property (Center Road)	13
Build additional shelters	11
Provide for and allow camping	4
Build a bridge over the railroad tracks	0
Have separate entrances for motorized and non-motorized	0
Build entrance on east side of property	0

Figure B.1: